# INSTALLATION INSTRUCTION

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**SAVE THIS MANUAL**

PREDATOR™

**SINGLE PACKAGE HEAT PUMP**

**HIGH EFFICIENCY**

**BP078, 090,102, 120 AND 150**

**6-1/2 TO 12-1/2 TON)**

*BP -078*

*-090*

*-102*

*-120*

*-150*

*Tested in accordance with:*

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**B P 120 N 15 A 2 A AA 1 A**

## TABLE 1: PRODUCT NOMENCLATURE

| Model # | Model Number Description | Options | | |
|---|---|---|---|---|
| **B** | Product Category | B = Single Package Heat Pumps | | |
| **P** | Product Identifier | P = High Efficiency | | |
| **120** | Nominal Cooling Capacity MBH | 078 = 6-1/2 Ton<br>090 = 7-1/2 Ton | 102 = 8-1/2 Ton<br>120= 10 Ton | 150 = 12-1/2 Ton |
| **C** | Heat Type | C = Cooling Only | | |
| **00** | Nominal Heating Capacity | 00 = No Heat Installed | | |
| **A** | Airflow | A = SM<br>B = SM/EC/BR<br>C = SM/EC/PE | D = SM/MD/SR<br>N = High Static Motor<br>P = High Static Motor/EC/BR | Q = High Static Motor/EC/PE<br>R = High Static Motor/MD |
| **2** | Voltage | 2 = 208/230-3-60 | 4 = 460-3-60 | 5 = 575-3-60 |
| **A** | Installation Options | A= None<br>B = 1<br>C = 2<br>D = 1 & 2E = 3<br>F = 4 | G = 1 & 3<br>H = 1 & 4<br>J = 1, 2 & 3<br>K = 1, 2 & 4<br>L = 1, 3 & 4 | M = 1, 2, 3 & 4<br>N = 2 & 3<br>P = 2 & 4<br>Q = 2, 3 & 4<br>R = 3 & 4 |
| **AA** | Additional Options | AA = None<br>AB = PM<br>AC = CG<br>AD = DFS<br>AE = PM & CG<br>AF = PM & DFS | AG = CG & DFS<br>AH = PM, CG & DFS<br>TA = TCC<br>TB = TCC & PM<br>TC = TCC & CG | TD = TCC & DFS<br>TE = TCC, PM & CG<br>TF = TCC, PM & DFS<br>TG = TCC, CG & DFS<br>TH = TCC, PM, CG & DFS |
| **1** | Product Generation | 1 = First Generation | | |
| **A** | Product Style | A = Style A | | |

## TABLE 2: AIRFLOW ABBREVIATIONS

| ABBREVIATION | MEANING |
|---|---|
| **BR** | Barometric Relief |
| **EC** | Economizer |
| **MD** | Motorized Damper |
| **PE** | Power Exhaust |
| **SM** | Standard Motor |

## TABLE 3: INSTALLATION ABBREVIATIONS

| ABBREVIATION | MEANING |
|---|---|
| **1** | Disconnect |
| **2** | Convenience Outlet |
| **3** | Smoke Detector Supply Air |
| **4** | Smoke Detector Return Air |

## TABLE 4: ADDITIONAL OPTIONS ABBREVIATIONS

| ABBREVIATION | MEANING |
|---|---|
| **CG** | Coil Guard |
| **DFS** | Dirty Filter Switch |
| **PM** | Phase Monitor |
| **TCC** | Technicoat Condenser Coil |

**⚠ WARNING**

*If the information in this manual is not followed exactly, a fire or explosion may result causing property damage, personal injury or loss of life.*

*Do not store or use gasoline or other flammable vapors and liquids in the vicinity of this or any other appliance.*

## GENERAL

YORK® Predator™heat pump units are single package reverse cycle air conditioners designed for outdoor installation on a rooftop or slab and for non-residential use. These units can be equipped with field installed electric heaters for heating applications.

These units are completely assembled on rigid, permanently attached base rails. All piping, refrigerant charge, and electrical wiring is factory installed and tested. The units require electric power and duct connections. The electric heaters have nickel-chrome elements and utilize single-point power connection.

## SAFETY CONSIDERATIONS

Due to system pressure, moving parts, and electrical components, installation and servicing of air conditioning equipment can be hazardous. Only qualified, trained service personnel should install, repair, or service this equipment. Untrained personnel can perform basic maintenance functions of cleaning coils and filters and replacing filters.

Observe all precautions in the literature, labels, and tags accompanying the equipment whenever working on air conditioning equipment. Be sure to follow all other applicable safety precautions and codes including ANSI Z223.1 - latest edition. Wear safety glasses and work gloves. Use quenching cloth and have a fire extinguisher available during brazing operations.

## NOTES, CAUTIONS AND WARNINGS

Installer should pay particular attention to the words: NOTE, CAUTION, and WARNING. Notes are intended to clarify or make the installation easier. CAUTIONS are given to prevent equipment damage. WARNINGS are given to alert installer that personal injury and/or equipment damage may result if installation procedure is not handled properly.

## APPROVALS

Design certified by CSA as follows:

1. For use as a cooling only unit or cooling unit with supplemental electric heat forced air furnace.
2. *For outdoor installation only.*
3. For installation on combustible material and may be installed directly on combustible flooring or, in the U.S., on wood flooring or Class A, Class B or Class C roof covering materials.

## REFERENCE

Additional information is available in the following reference forms:

- - Technical Guide
- - General Installation
- - Pre-start & Post-start Check List
- - Economizer Accessory
- - Motorized Outdoor Air Damper
- - Manual Outdoor Air Damper (0-100%)
- - Manual Outdoor Air Damper (0-35%)
- - Electric Heater Accessory
- - Unit Renewal Parts List

All forms referenced in this instruction may be ordered from:

Standard Register
2101 West Tecumseh Road
Norman, OK 73069
Toll Free Fax: (877) 379-7920
Toll Free Phone: (877) 318-9675

## INSPECTION

As soon as a unit is received, it should be inspected for possible damage during transit. If damage is evident, the extent of the damage should be noted on the carrier's freight bill. A separate request for inspection by the carrier's agent should be made in writing.

**⚠ WARNING**

*This unit is not to be used for temporary heating of buildings or structures under construction.*

*Before performing service or maintenance operations on unit, turn off main power switch to unit. Electrical shock could cause personal injury. Improper installation, adjustment, alteration, service or maintenance can cause injury or property damage. Refer to this manual. For assistance or additional information consult a qualified installer or service agency.*

## INSTALLATION

### PRECEDING INSTALLATION

1. Remove the two screws holding the brackets in the front, rear and compressor side fork-lift slots.

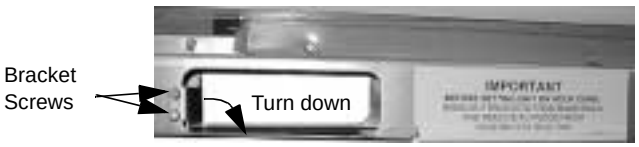



**FIGURE 1 : UNIT SHIPPING BRACKET**

2. Turn each bracket toward the ground and the protective plywood covering will drop to the ground.

3. Remove the condenser coil external protective covering prior to operation.

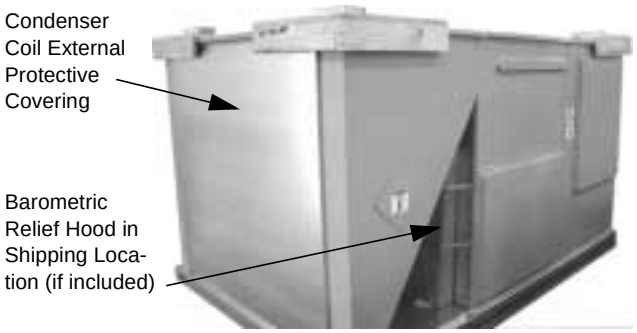



**FIGURE 2 : CONDENSER COVERING**

4. Remove the toolless doorknobs and instruction packet prior to installation.

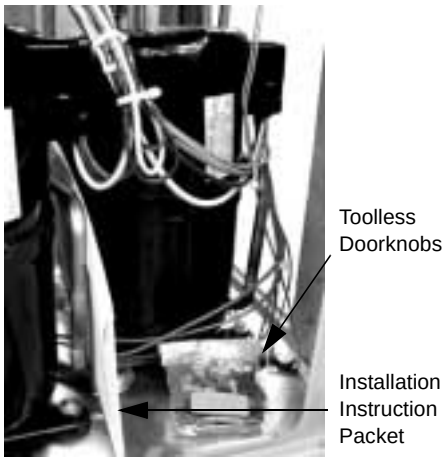



**FIGURE 3 : COMPRESSOR SECTION**

## LIMITATIONS

**⚠ CAUTION**

*This product must be installed in strict compliance with this installation instruction and any applicable local, state and national codes including, but not limited to, building, electrical, and mechanical codes.*

These units must be installed in accordance with the following:

In U.S.A.:

1. National Electrical Code, ANSI/NFPA No. 70 - Latest Edition
2. Local building codes, and
3. Local electric utility requirements.

In Canada:

1. Canadian Electrical Code, CSA C22.1,
2. Canadian installation codes, CSA-B149,
3. Local plumbing and waste water codes, and
4. Other applicable local codes.

Refer to Tables 6 & 7 for unit application data.

If components are to be added to a unit to meet local codes, they are to be installed at the dealer's and/or customer's expense.

Size of unit for proposed installation should be based on heat loss/heat gain calculation made according to the methods of Air Conditioning Contractors of America (ACCA), American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) or any other recognized authority.

**TABLE 5: UNIT VOLTAGE LIMITATIONS**

| Power Rating* | Minimum | Maximum |
|---|---|---|
| **380/415-3-50** | 342 | 456 |

* Rated in accordance with ARI Standard 110, utilization range "A".

**TABLE 6: UNIT VOLTAGE LIMITATIONS**

| Power Rating* | Minimum | Maximum |
|---|---|---|
| **208/230-3-60** | 187 | 252 |
| **460-3-60** | 432 | 504 |
| **575-3-60** | 540 | 630 |

* Rated in accordance with ARI Standard 110, utilization range "A".

**TABLE 7: UNIT TEMPERATURE LIMITATIONS**

| Temperature | Min. | Max. |
|---|---|---|
| **Wet Bulb Temp (°F) of Air on Evap Coil** | 57 | 72 |
| **Dry Bulb Temp (°F) of Air on Cond Coil** | 0 | 125 |

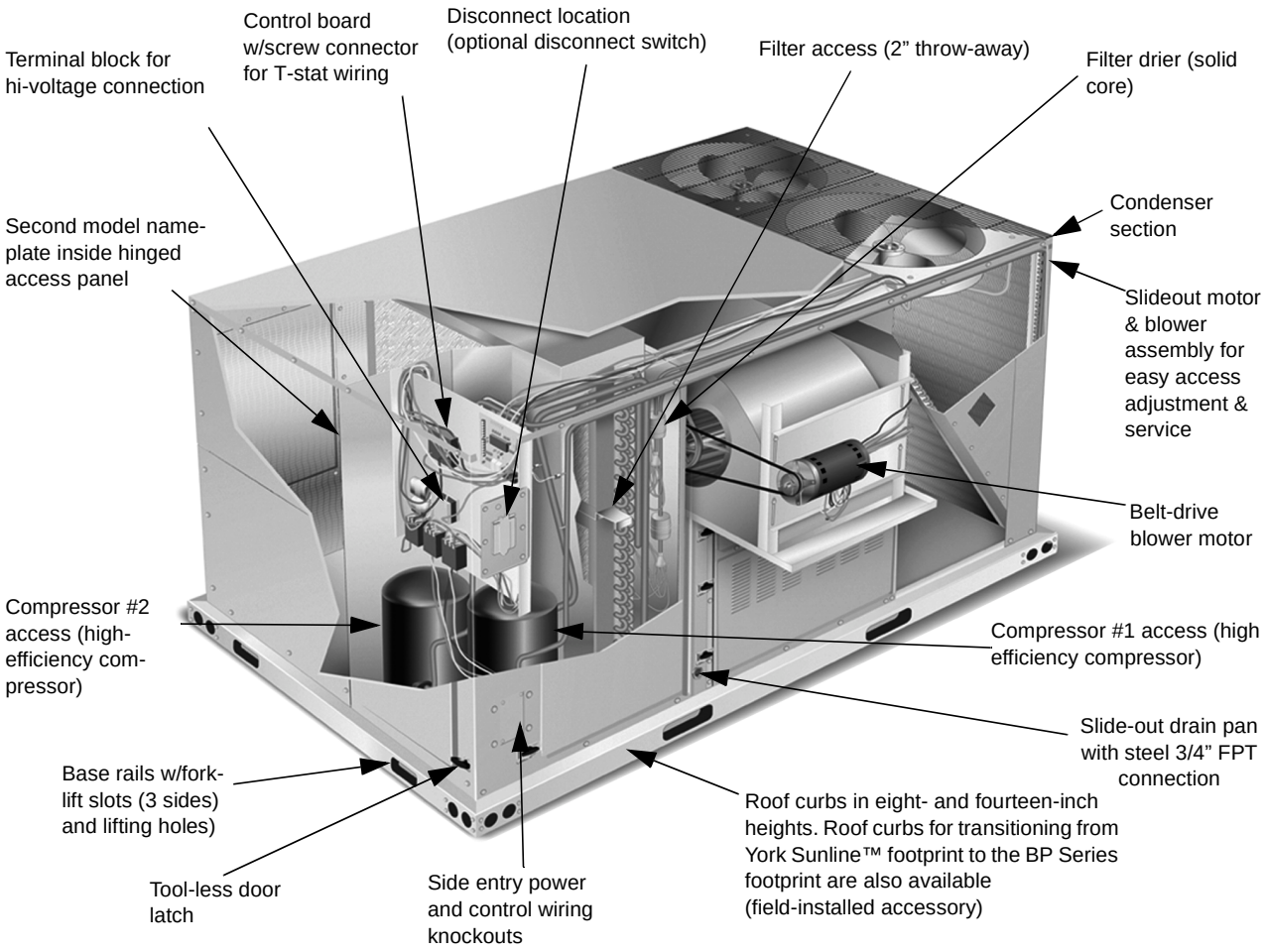

Terminal block for hi-voltage connection
Control board w/screw connector for T-stat wiring
Disconnect location (optional disconnect switch)
Filter access (2” throw-away)
Filter drier (solid core)
Condenser section
Second model name-plate inside hinged access panel
Slideout motor & blower assembly for easy access adjustment & service
Belt-drive blower motor
Compressor #2 access (high-efficiency com-pressor)
Compressor #1 access (high efficiency compressor)
Slide-out drain pan with steel 3/4” FPT connection
Base rails w/fork-lift slots (3 sides) and lifting holes)
Roof curbs in eight- and fourteen-inch heights. Roof curbs for transitioning from York Sunline™ footprint to the BP Series footprint are also available (field-installed accessory)
Tool-less door latch
Side entry power and control wiring knockouts

**FIGURE 4 : PREDATOR™ COMPONENT LOCATION**

## LOCATION

Use the following guidelines to select a suitable location for these units:

1. Unit is designed for *outdoor installation only.*
2. Condenser coils must have an unlimited supply of air. Where a choice of location is possible, position the unit on either north or east side of building.
3. Suitable for mounting on roof curb.
4. Roof structures must be able to support the weight of the unit and its options/accessories. Unit must be installed on a solid, level roof curb or appropriate angle iron frame.
5. Maintain level tolerance to 1/2-inch across the entire width and length of unit.

## RIGGING AND HANDLING

Exercise care when moving the unit. Do not remove any packaging until the unit is near the place of installation. Rig the unit by attaching chain or cable slings to the lifting holes provided in the base rails. Spreader bars, whose length exceeds the largest dimension across the unit, **MUST** be used across the top of the unit.

**⚠ CAUTION**

*If a unit is to be installed on a roof curb other than a YORK roof curb, gasketing must be applied to all surfaces that come in contact with the unit under-side.*

Before lifting, make sure the unit weight is distributed equally on the rigging cables so it will lift evenly.

Units may be moved or lifted with a forklift. Slotted openings in the base rails are provided for this purpose.

*Length of forks must be a minimum of 48 inches.*

Remove the nesting brackets from the four, top corners of the unit. All screws that are removed when taking off these rackets must be replaced on the unit.

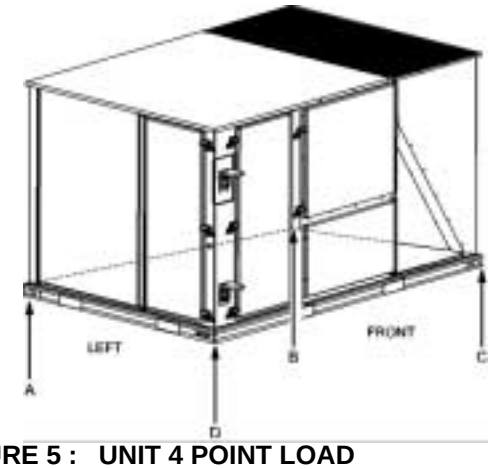



**FIGURE 5 : UNIT 4 POINT LOAD**

**⚠ CAUTION**

*All panels must be secured in place when the unit is lifted.*

*The condenser coils should be protected from rigging cable damage with plywood or other suitable material.*

**TABLE 8: UNIT WEIGHTS**

| Model | Shipping Weight (lb.) | Operating Weight (lb.) |
|---|---|---|
| **BP078** | 1104 | 1099 |
| **BP090** | 1108 | 1103 |
| **BP102** | 1178 | 1173 |
| **BP120** | 1212 | 1207 |
| **BP150** | 1202 | 1197 |
| **Econ.** | 85 | 84 |
| **w/ PE** | 150 | 148 |
| **Elec. Heat*** | 49 | 49 |

* 54kW heater.

**TABLE 9: 4 POINT LOAD WEIGHT**

| Model | Location (lbs.) | | | |
|---|---|---|---|---|
| | A | B | C | D |
| **BP078** | 241 | 206 | 300 | 352 |
| **BP090** | 242 | 207 | 301 | 353 |
| **BP102** | 257 | 220 | 321 | 375 |
| **BP120** | 265 | 226 | 330 | 386 |
| **BP150** | 263 | 224 | 327 | 383 |

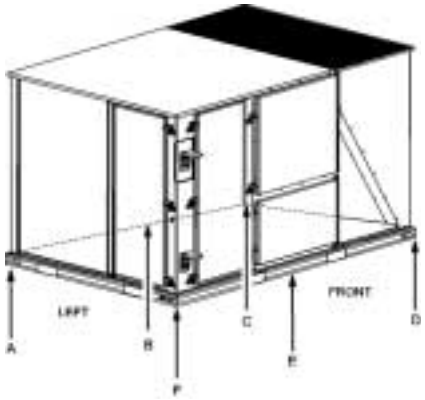



**FIGURE 6 : UNIT 6 POINT LOAD**

**TABLE 10: 6 POINT LOAD WEIGHT**

| Model | Location (lbs.) | | | | | |
|---|---|---|---|---|---|---|
| | A | B | C | D | E | F |
| **BP078** | 165 | 148 | 134 | 195 | 216 | 241 |
| **BP090** | 166 | 149 | 134 | 196 | 217 | 242 |
| **BP102** | 176 | 158 | 143 | 208 | 231 | 257 |
| **BP120** | 181 | 163 | 147 | 214 | 237 | 264 |
| **BP150** | 180 | 161 | 146 | 213 | 235 | 262 |

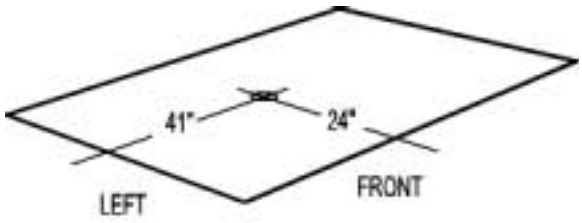



**FIGURE 7 : UNIT CENTER OF GRAVITY**

## CLEARANCES

All units require particular clearances for proper operation and service.

> **⚠ WARNING**
>
> *Do not permit overhanging structures or shrubs to obstruct condenser air discharge outlet.*

**TABLE 11: UNIT CLEARANCES**

| | | | |
|---|---|---|---|
| **Top*** | 72” | **Right** | 12” |
| **Front** | 36” | **Left** | 36” |
| **Rear†** | 36” | **Bottom‡** | 0” |

* Units must be installed outdoors. Overhanging structure or shrubs should not obstruct condenser air discharge outlet.

† To remove the slide-out drain pan, a rear clearance of sixty inches is required. If space is unavailable, the drain pan can be removed through the front by separating the corner wall.

‡ Units may be installed on combustible floors made from wood or class A, B or C roof covering materials.

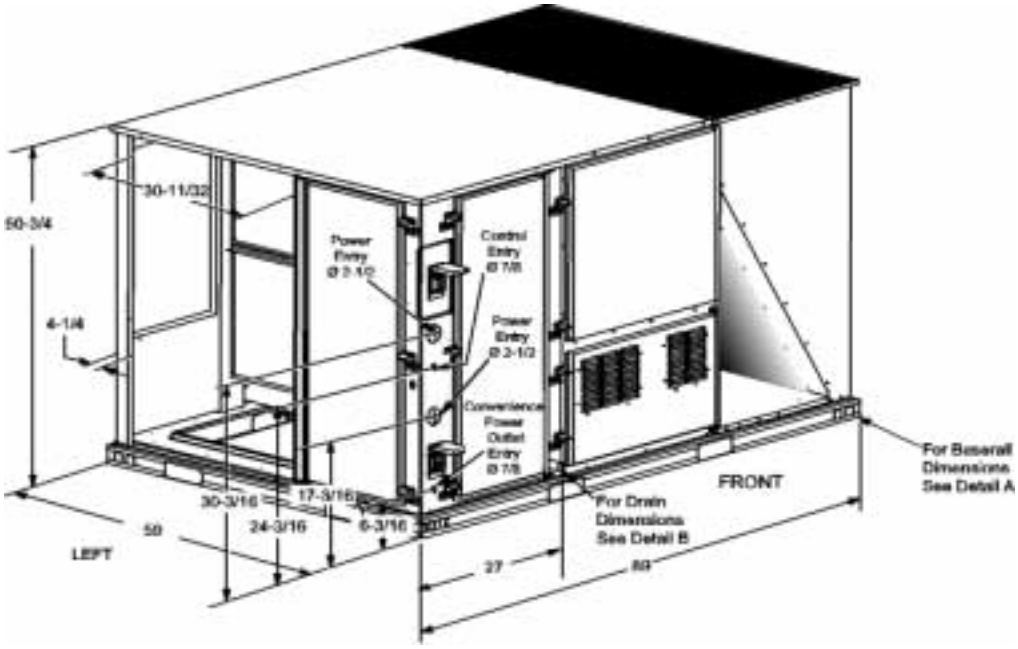
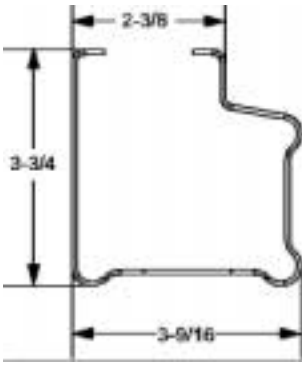


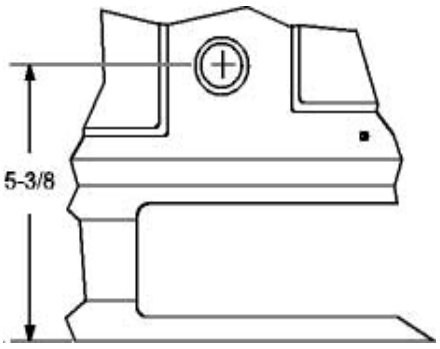

**FIGURE 8 : UNIT DIMENSIONS**

NOTE:A one-inch clearance must be provided between any combustible material and the supply ductwork for a distance of 3 feet from the unit.

**DETAIL A**




**DETAIL B**



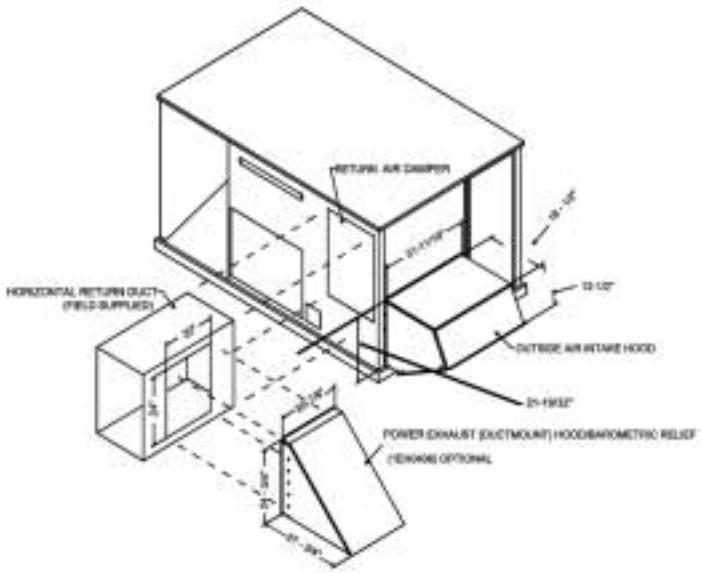



**FIGURE 9 : HORIZONTAL ECONOMIZER**

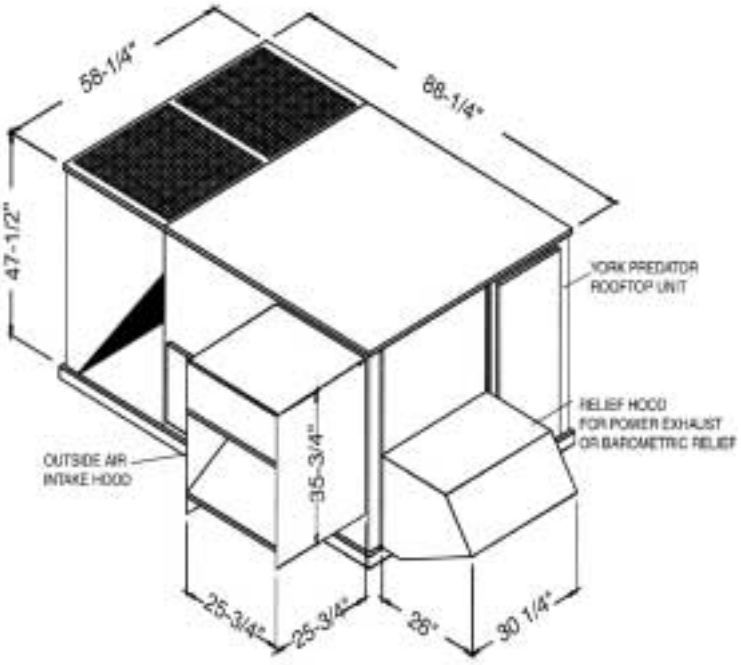



**FIGURE 10 : DOWNFLOW ECONOMIZER HOOD DETAIL**

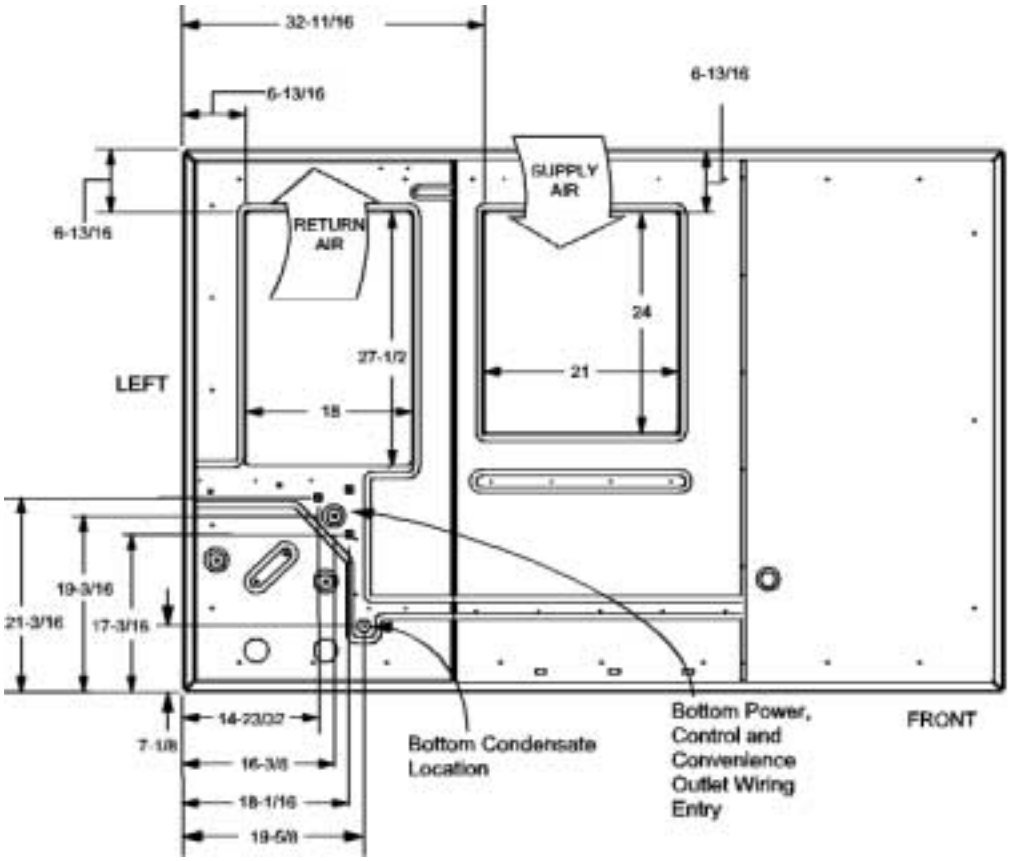



**FIGURE 11 : BOTTOM AIR DUCT OPENINGS**

## DUCTWORK

Ductwork should be designed and sized according to the methods in Manual D of the Air Conditioning Contractors of America (ACCA) or as recommended by any other recognized authority such as ASHRAE or SMACNA.

A closed return duct system should be used. This will not preclude use of economizers or outdoor fresh air intake. The supply and return air duct connections at the unit should be made with flexible joints to minimize noise.

The supply and return air duct systems should be designed for the CFM and static pressure requirements of the job. They should NOT be sized to match the dimensions of the duct connections on the unit.

**⚠ CAUTION**

*When fastening ductwork to side duct flanges on unit, insert screws through duct flanges only. DO NOT insert screws through casing. Outdoor ductwork must be insulated and water-proofed.*

Refer to Figure 11 for bottom air duct openings. Refer to Figure 10 for side air duct openings.

## DUCT COVERS

Units are shipped with the side duct openings covered and a covering over the bottom of the unit. For bottom duct application, no duct cover changes are necessary. For side duct application, remove the side duct covers and install over the bottom duct openings. The panels removed from the side duct connections are designed to be reused by securing each panel to its respective downflow opening. But keep in mind that the supply panel is installed with the painted surface UP, facing the heat exchanger, while the return panel is installed with the painted surface DOWN, facing the downflow duct opening. The supply panel is secured with a bracket (already in place from the factory) and two screws. It's a snug fit for the panel when sliding it between the heat exchanger and unit bottom, but there is room. The return panel is secured with four screws.

**FIGURE 12 : SIDE PANELS WITH HOLE PLUGS**

*Note orientation. Panel is "insulation" side up.*

**FIGURE 13 : RETURN DOWNFLOW PLENUM WITH PANEL**

**FIGURE 14 : DISCHARGE PANEL IN PLACE**

*Note Bracket and orientation. Panel is face up.*

## CONDENSATE DRAIN

The side condensate drain is reversible and maybe re-oriented to the rear of the cabinet to facilitate condensate piping. A condensate drain connection is available through the base pan for piping inside the roof curb. Trap the connection per Figure 15. The trap and drain lines should be protected from freezing.

Plumbing must conform to local codes. Use a sealing compound on male pipe threads. Install condensate drain line from the 3/4 inch NPT female connection on the unit to an open drain.

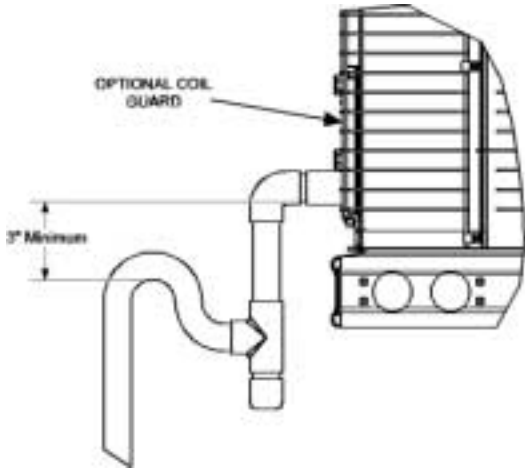



**FIGURE 15 : CONDENSATE DRAIN**

## COMPRESSORS

The compressors are mounted on elastomer insulators. The mounting bolts have been fully tightened for shipping. Do not loosen the compressor mounting bolts.

## FILTERS

Two-inch filters are supplied with each unit. One-inch filters may be used with no modification to the filter racks. Filters must always be installed ahead of evaporator coil and must be kept clean or replaced with same size and type. Dirty filters reduce the capacity of the unit and result in frosted coils or safety shutdown. All units use four (4) 20"x25"x2" filters. The unit should not be operated without filters properly installed.

**⚠ CAUTION**

*Make sure that panel latches are properly positioned on the unit to maintain an airtight seal.*

## THERMOSTAT WIRING

The thermostat should be located on an inside wall approximately 56 inches above the floor where it will not be subject to drafts, sun exposure or heat from electrical fixtures or appliances. Follow the manufacturer's instructions enclosed with thermostat for general installation procedure. Color-coded, insulated wires should be used to connect the thermostat to the unit. Refer to Table 12 for control wire sizing and maximum length.

### TABLE 12: CONTROL WIRE SIZES

| Wire Size | Maximum Length* |
|---|---|
| 18 AWG | 150 Feet |

* From the unit to the thermostat and back to the unit.

## POWER AND CONTROL WIRING

Field wiring to the unit, fuses, and disconnects must conform to provisions of National Electrical Code (NEC), ANSI/NFPA 70 – Latest Edition, and/or local ordinances. The unit must be electrically grounded in accordance with NEC ANSI/NFPA – Latest Edition and/or local codes. In Canada, the unit must conform to CSA C22.1.

Voltage tolerances which must be maintained at the compressor terminals during starting and running conditions are indicated on the unit Rating Plate and Table 6.

**⚠ CAUTION**

*Avoid damage to internal components if drilling holes for disconnect mounting.*

The internal wiring harnesses furnished with this unit are an integral part of the design certified unit. Field alteration to comply with electrical codes should not be required. If any of the wire supplied with the unit must be replaced, replacement wire must be of the type shown on the wiring diagram and the same minimum gauge as the replaced wire.

A disconnect must be utilized for these units. Factory installed disconnects are available. If installing a disconnect (field supplied), refer to Figure 4 for the recommended mounting location.

**NOTE:** Since not all local codes allow the mounting of a disconnect on the unit, please confirm compliance with local code before mounting a disconnect on the unit.

Electrical line must be sized properly to carry the load. USE COPPER CONDUCTORS ONLY. Each unit must be wired with a separate branch circuit fed directly from the meter panel and properly fused.

Refer to Figures 16, 17 and 18 for typical field wiring and to the appropriate unit wiring diagram mounted inside control doors for control circuit and power wiring information.

**⚠ CAUTION**

*When connecting electrical power and control wiring to the unit, water-proof connectors must be used so that water or moisture cannot be drawn into the unit during normal operation. The above water-proofing conditions will also apply when installing a field supplied disconnect switch.*

## POWER WIRING DETAIL

Units are factory wired for the voltage shown on the unit nameplate. Refer to Electrical Data Tables 14 through 17 to size power wiring, fuses, and disconnect switch.

Power wiring is brought into the unit through the side of the unit or the basepan inside the curb.

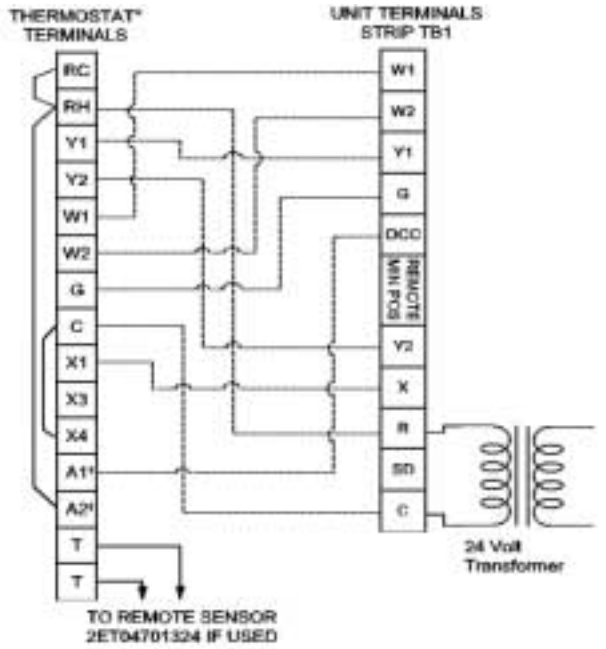



**FIGURE 16 : ELECTRONIC THERMOSTAT FIELD WIRING**

**⚠ CAUTION**

*The thermostat must provide a "G" signal when there is a call for "W1."The unit control board will energize the indoor blower when the compressors are energized; however, if the thermostat calls for "W2" during the anti-short-cycle delay, the electric heat (when installed) will be energized immediately upon the call for "W2."*

**NOTE:** This unit does NOT REQUIRE a heat pump thermostat. It is designed to work with a standard two-stage cool, two-stage heat thermostat; however, the thermostat must provide a "G" signal when there is a call for "W1".

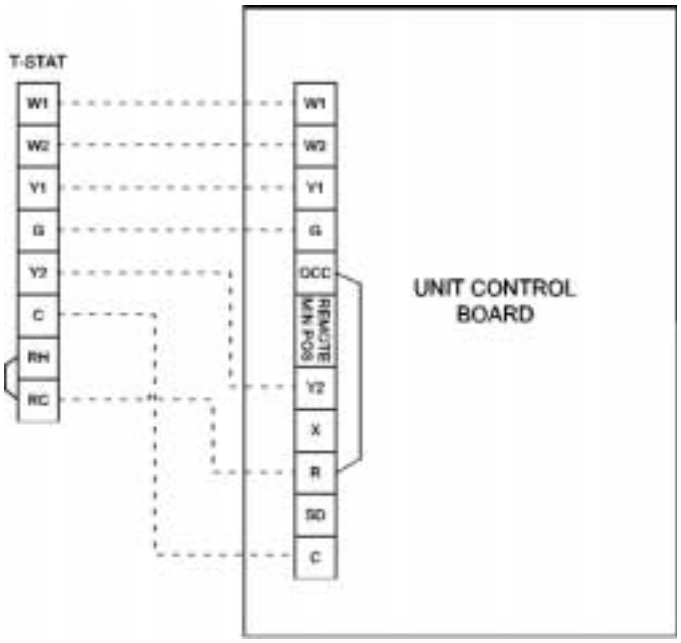



**FIGURE 17 : FIELD WIRING 24 VOLT THERMOSTAT**

**⚠ CAUTION**

*The thermostat must provide a "G" signal when there is a call for "W1."The unit control board will energize the indoor blower when the compressors are energized; however, if the thermostat calls for "W2" during the anti-short-cycle delay, the electric heat (when installed) will be energized immediately upon the call for "W2."*

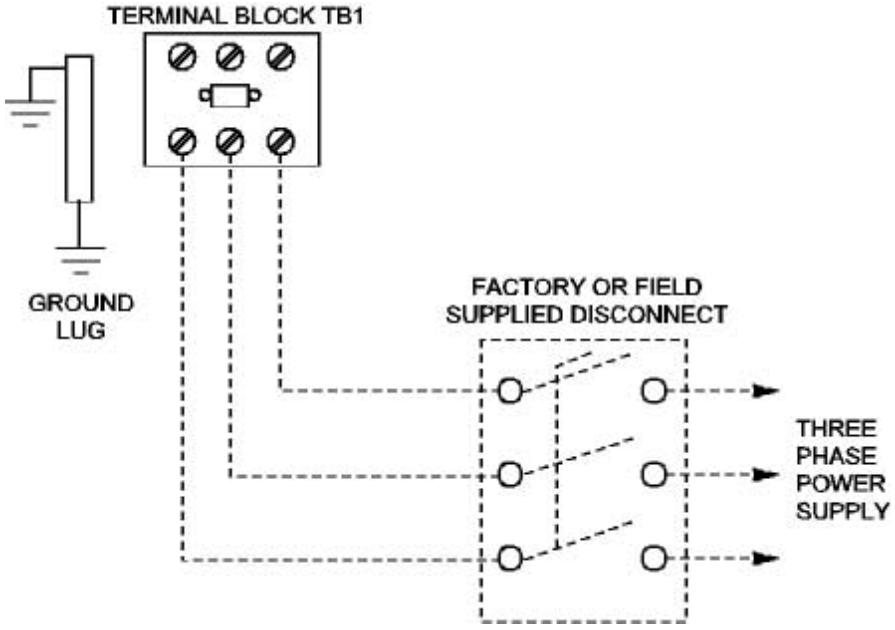



**FIGURE 18 : FIELD WIRING DISCONNECT**

## TABLE 13: ELECTRICAL DATA 6-1/2 TON

| Voltage | Compressors | | OD Fan Motors FLA | Blower Motor, Supply FLA | | Pwr Exh Motor FLA | Electric Heater | | | Min. Circuit Ampacity (Amps) | | MCA w/ Power Exhaust Amps | | Max Fuse Size *Amps | | Max Fuse Size w/ Pwr. Exh. *Amps | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RLA | LRA | | 1.5 HP | 2 HP | | Model No. | Rated kW | Heater Amps | 1.5 HP | 2 HP | 1.5 HP | 2 HP | 1.5 HP | 2 HP | 1.5 HP | 2 HP |
| 208 | 21.2 | 146 | 1.6 | 6.2 | 8.2 | 5.5 | None | - | - | 35.9 | 37.9 | 41.4 | 43.4 | 50 | 50 | 60 | 60 |
| | | | | | | | 2TP04510925 | 6.8 | 18.9 | 59.5 | 61.5 | 65.0 | 67.0 | 70 | 70 | 70 | 70 |
| | | | | | | | 2TP04511825 | 13.5 | 37.5 | 82.7 | 84.7 | 88.2 | 90.2 | 90 | 90 | 90 | 100 |
| | | | | | | | 2TP04512425 | 18.0 | 50.0 | 98.4 | 100.4 | 103.9 | 105.9 | 100 | 110 | 110 | 110 |
| | | | | | | | 2TP04513625 | 25.5 | 70.8 | 124.4 | 126.4 | 129.9 | 131.9 | 125 | 150 | 150 | 150 |
| 230 | 21.2 | 146 | 1.6 | 6.2 | 8.2 | 5.5 | None | - | - | 35.9 | 37.9 | 41.4 | 43.4 | 50 | 50 | 60 | 60 |
| | | | | | | | 2TP04510925 | 9.0 | 21.7 | 63.0 | 65.0 | 68.5 | 70.5 | 70 | 70 | 70 | 80 |
| | | | | | | | 2TP04511825 | 18.0 | 43.3 | 90.0 | 92.0 | 95.5 | 97.5 | 100 | 100 | 100 | 100 |
| | | | | | | | 2TP04512425 | 24.0 | 57.7 | 108.1 | 110.1 | 113.6 | 115.6 | 110 | 125 | 125 | 125 |
| | | | | | | | 2TP04513625 | 34.0 | 81.8 | 138.1 | 140.1 | 143.6 | 145.6 | 150 | 150 | 150 | 150 |
| 460 | 10.6 | 73 | 0.8 | 3.1 | 4.1 | 2.2 | None | - | - | 18.0 | 19.0 | 20.2 | 21.2 | 25 | 25 | 30 | 30 |
| | | | | | | | 2TP04510946 | 9.0 | 10.8 | 31.5 | 32.5 | 33.7 | 34.7 | 35 | 35 | 35 | 40 |
| | | | | | | | 2TP04511846 | 18.0 | 21.7 | 45.0 | 46.0 | 47.2 | 48.2 | 50 | 50 | 50 | 50 |
| | | | | | | | 2TP04512446 | 24.0 | 28.9 | 54.0 | 55.0 | 56.2 | 57.2 | 60 | 60 | 60 | 60 |
| | | | | | | | 2TP04513646 | 34.0 | 40.9 | 69.1 | 70.1 | 71.3 | 72.3 | 70 | 80 | 80 | 80 |
| 575 | 8.5 | 58 | 0.6 | 2.4 | 3.6 | 1.8 | None | - | - | 14.2 | 15.4 | 16.0 | 17.2 | 20 | 20 | 20 | 25 |
| | | | | | | | 2TP04510958 | 9.0 | 8.7 | 25.1 | 26.3 | 26.9 | 28.1 | 30 | 30 | 30 | 30 |
| | | | | | | | 2TP04511858 | 18.0 | 17.3 | 35.9 | 37.1 | 37.7 | 38.9 | 40 | 40 | 40 | 40 |
| | | | | | | | 2TP04512458 | 24.0 | 23.1 | 43.1 | 44.3 | 44.9 | 46.1 | 45 | 45 | 45 | 50 |
| | | | | | | | 2TP04513658 | 34.0 | 32.7 | 55.1 | 46.3 | 56.9 | 58.1 | 60 | 60 | 60 | 60 |

## TABLE 14: ELECTRICAL DATA 7-1/2 TON

| Voltage | Compressors | | OD Fan Motors FLA | Blower Motor Supply FLA | | Pwr Exh Motor FLA | Electric Heater | | | Min. Circuit Ampacity(Amps) | | MCA w/Power Exhaust Amps | | Max Fuse* Size (Amps) | | Max Fuse Size w/ Pwr. Exh. *Amps | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RLA | LRA | | 1.5 HP | 2 HP | | Model No. | Rated kW | Heater Amps | 1.5 HP | 2 HP | | | 1.5 HP | 2 HP | 1.5 HP | 2 HP |
| **208** | 14.1 | 110 | 1.5 | 6.2 | 8.2 | 5.5 | None | - | - | 40.9 | 42.9 | 46.4 | 48.4 | 50 | 50 | 60 | 60 |
| | | | | | | | 2TP04510925 | 6.8 | 18.9 | 40.9 | 42.9 | 70.0 | 72.0 | 70 | 70 | 70 | 80 |
| | | | | | | | 2TP04511825 | 13.5 | 37.5 | 54.6 | 57.1 | 93.3 | 95.3 | 90 | 90 | 100 | 100 |
| | | | | | | | 2TP04512425 | 18.0 | 50.0 | 70.2 | 72.7 | 108.9 | 110.9 | 110 | 110 | 110 | 125 |
| | | | | | | | 2TP04513625 | 25.5 | 70.8 | 96.2 | 98.7 | 134.9 | 136.9 | 150 | 150 | 150 | 150 |
| **230** | 14.1 | 110 | 1.5 | 6.2 | 8.2 | 5.5 | None | - | - | 40.9 | 42.9 | 46.4 | 48.4 | 50 | 50 | 60 | 60 |
| | | | | | | | 2TP04510925 | 9.0 | 21.7 | 40.9 | 42.9 | 73.5 | 75.5 | 70 | 70 | 80 | 80 |
| | | | | | | | 2TP04511825 | 18.0 | 43.3 | 61.9 | 64.4 | 100.6 | 102.6 | 100 | 100 | 110 | 110 |
| | | | | | | | 2TP04512425 | 24.0 | 57.7 | 79.9.1 | 82.4 | 118.6 | 120.6 | 125 | 125 | 125 | 125 |
| | | | | | | | 2TP04513625 | 34.0 | 81.8 | 110.0 | 112.5 | 148.7 | 150.7 | 150 | 150 | 150 | 175 |
| **460** | 7.1 | 54 | 0.8 | 3.1 | 4.1 | 2.2 | None | - | - | 20.7 | 21.7 | 22.9 | 23.9 | 25 | 25 | 25 | 30 |
| | | | | | | | 2TP04510946 | 9.0 | 10.8 | 20.7 | 21.7 | 36.4 | 37.4 | 35 | 40 | 40 | 40 |
| | | | | | | | 2TP04511846 | 18.0 | 21.7 | 30.9 | 32.2 | 49.9 | 50.9 | 50 | 50 | 50 | 60 |
| | | | | | | | 2TP04512446 | 24.0 | 28.9 | 40.0 | 41.2 | 59.0 | 60.0 | 60 | 60 | 60 | 60 |
| | | | | | | | 2TP04513646 | 34.0 | 40.9 | 55.0 | 56.2 | 74.0 | 75.0 | 80 | 80 | 80 | 80 |
| **575** | 5.8 | 44 | 0.6 | 2.4 | 3.6 | 1.8 | None | - | - | 16.7 | 17.9 | 18.5 | 19.7 | 20 | 20 | 20 | 25 |
| | | | | | | | 2TP04510958 | 9.0 | 8.7 | 16.7 | 17.9 | 29.3 | 30.5 | 30 | 30 | 30 | 35 |
| | | | | | | | 2TP04511858 | 18.0 | 17.3 | 24.7 | 26.2 | 40.1 | 41.3 | 40 | 40 | 40 | 40 |
| | | | | | | | 2TP04512458 | 24.0 | 23.1 | 31.9 | 33.4 | 47.3 | 48.5 | 40 | 50 | 50 | 50 |
| | | | | | | | 2TP04513658 | 34.0 | 32.7 | 43.9 | 45.4 | 59.3 | 60.5 | 60 | 60 | 60 | 70 |

* Maximum HACR breaker of the same amp size is applicable.

## TABLE 15: ELECTRICAL DATA 8-1/2 TON

| Voltage | Compressors | | | Blower Motor, Supply FLA | | Power Exhaust Motor FLA | Electric Heater | | | Min.Circuit Ampacity Amps | | MCA w/Power Exhaust Amps | | Max Fuse Size | | Max Fuse Size w/ Pwr. Exh. * Amps | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RLA | LRA | OD Fan Moto FLA | 2 HP | 3 HP | | Model No. | Rated kW | Heater Amps | 2 HP | 3 HP | 2 HP | 3 HP | 2 HP | 3 HP | 2 HP | 3 HP |
| 208 | 14.7 | 130 | 3.5 | 8.2 | 10.9 | 5.5 | None | - | - | 48.3 | 51.0 | 53.8 | 56.5 | 60 | 60 | 60 | 70 |
| | | | | | | | 2TP04510925 | 6.8 | 18.9 | 71.9 | 74.6 | 77.4 | 80.1 | 80 | 80 | 80 | 90 |
| | | | | | | | 2TP04511825 | 13.5 | 37.5 | 95.1 | 97.8 | 100.6 | 103.3 | 100 | 100 | 110 | 110 |
| | | | | | | | 2TP04512425 | 18.0 | 50.0 | 110.7 | 113.4 | 116.2 | 118.9 | 125 | 125 | 125 | 125 |
| | | | | | | | 2TP04513625 | 25.5 | 70.8 | 136.8 | 139.5 | 142.3 | 145.0 | 150 | 150 | 150 | 150 |
| 230 | 14.7 | 130 | 3.5 | 8.2 | 10.9 | 5.5 | None | - | - | 48.3 | 51.0 | 53.8 | 56.5 | 60 | 60 | 60 | 70 |
| | | | | | | | 2TP04510925 | 9.0 | 21.7 | 75.3 | 78.0 | 80.8 | 83.5 | 80 | 80 | 90 | 90 |
| | | | | | | | 2TP04511825 | 18.0 | 43.3 | 102.4 | 105.1 | 107.9 | 110.6 | 110 | 110 | 110 | 125 |
| | | | | | | | 2TP04512425 | 24.0 | 57.7 | 120.4 | 123.1 | 125.9 | 128.6 | 125 | 125 | 150 | 150 |
| | | | | | | | 2TP04513625 | 34.0 | 81.8 | 150.5 | 153.2 | 156.0 | 158.7 | 175 | 175 | 175 | 175 |
| 460 | 7.1 | 64 | 1.6 | 4.1 | 5.3 | 2.2 | None | - | - | 23.3 | 24.5 | 25.5 | 26.7 | 30 | 30 | 30 | 30 |
| | | | | | | | 2TP04510946 | 9.0 | 10.8 | 36.8 | 38.0 | 39.0 | 40.2 | 40 | 40 | 40 | 45 |
| | | | | | | | 2TP04511846 | 18.0 | 21.7 | 50.3 | 51.5 | 52.5 | 53.7 | 60 | 60 | 60 | 60 |
| | | | | | | | 2TP04512446 | 24.0 | 28.9 | 59.4 | 60.6 | 61.6 | 62.8 | 60 | 70 | 70 | 70 |
| | | | | | | | 2TP04513646 | 34.0 | 40.9 | 74.4 | 75.6 | 76.6 | 77.8 | 80 | 80 | 80 | 80 |
| 575 | 6.4 | 52 | 1.3 | 3.6 | 4.1 | 1.8 | None | - | - | 20.6 | 21.1 | 22.4 | 22.9 | 25 | 25 | 25 | 25 |
| | | | | | | | 2TP04510958 | 9.0 | 8.7 | 31.4 | 31.9 | 33.2 | 33.7 | 35 | 35 | 35 | 35 |
| | | | | | | | 2TP04511858 | 18.0 | 17.3 | 42.3 | 42.8 | 44.1 | 44.6 | 45 | 45 | 45 | 45 |
| | | | | | | | 2TP04512458 | 24.0 | 23.1 | 49.5 | 50.0 | 51.3 | 51.8 | 50 | 50 | 60 | 60 |
| | | | | | | | 2TP04513658 | 34.0 | 32.7 | 61.5 | 62.0 | 63.3 | 63.8 | 70 | 70 | 70 | 70 |

## TABLE 16: ELECTRICAL DATA 10 TON

| Voltage | Compressor | | | Blower Motor Supply FLA | | Power Exhaust Motor FLA | Electric Heater | | | Min. Circuit Ampacity (Amps) | | MCA w/Power Exhaust Amps | | Max Fuse* Size (Amps) | | Max Fuse Size w/ Power Exhaust | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | RLA | LRA | OD Fan Motor FLA | 2 HP | 3 HP | | Model No. | Rated kW | Heater Amps | 2 HP | 3 HP | 2 HP | 3 HP | 2 HP | 3 HP | 2 HP | 3 HP |
| 208 | 16.0 | 167 | 3.5 | 8.2 | 10.9 | 5.5 | None | - | - | 51.2 | 53.9 | 56.7 | 59.4 | 60 | 60 | 70 | 70 |
| | | | | | | | 2TP04511825 | 13.5 | 37.5 | 57.1 | 60.5 | 64.0 | 67.3 | 100 | 100 | 70 | 70 |
| | | | | | | | 2TP04512425 | 18.0 | 50.0 | 72.7 | 76.1 | 79.6 | 83.0 | 125 | 125 | 80 | 90 |
| | | | | | | | 2TP04513625 | 25.5 | 70.8 | 98.7 | 102.1 | 105.6 | 109.0 | 150 | 150 | 110 | 110 |
| | | | | | | | 2HP04505425† | 40.6 | 112.7 | 151.1 | 154.5 | 158.0 | 161.4 | 175 | 175 | 175 | 175 |
| 230 | 16.0 | 167 | 3.5 | 8.2 | 10.9 | 5.5 | None | - | - | 51.2 | 53.9 | 56.7 | 59.4 | 60 | 60 | 70 | 70 |
| | | | | | | | 2TP04511825 | 18.0 | 43.3 | 64.4 | 67.8 | 71.3 | 74.6 | 110 | 110 | 80 | 80 |
| | | | | | | | 2TP04512425 | 24.0 | 57.7 | 82.4 | 85.8 | 89.3 | 92.7 | 125 | 125 | 90 | 100 |
| | | | | | | | 2TP04513625 | 34.0 | 81.8 | 112.5 | 115.9 | 119.4 | 122.7 | 175 | 175 | 125 | 125 |
| | | | | | | | 2HP04505425† | 54.0 | 129.9 | 140.2 | 143.5 | 147.0 | 150.4 | 175 | 175 | 150 | 175 |
| 460 | 8.3 | 69 | 1.6 | 4.1 | 5.3 | 2.2 | None | - | - | 26.0 | 27.2 | 28.2 | 29.4 | 30 | 35 | 35 | 35 |
| | | | | | | | 2TP04511846 | 18.0 | 21.7 | 32.2 | 33.7 | 34.9 | 44.0 | 60 | 60 | 35 | 40 |
| | | | | | | | 2TP04512446 | 24.0 | 28.9 | 41.2 | 42.7 | 44.0 | 45.5 | 70 | 70 | 45 | 50 |
| | | | | | | | 2TP04513646 | 34.0 | 40.9 | 56.2 | 57.7 | 59.0 | 60.5 | 80 | 80 | 60 | 70 |
| | | | | | | | 2HP04505446C | 54.0 | 65.0 | 70.1 | 71.6 | 72.8 | 74.3 | 80 | 80 | 80 | 80 |
| 575 | 6.4 | 58 | 1.3 | 3.6 | 4.1 | 1.8 | None | - | - | 20.6 | 21.1 | 22.4 | 22.9 | 25 | 25 | 25 | 25 |
| | | | | | | | 2TP04511858 | 18.0 | 17.3 | 26.2 | 26.8 | 28.4 | 29.0 | 45 | 45 | 30 | 30 |
| | | | | | | | 2TP04512458 | 24.0 | 23.1 | 33.4 | 34.0 | 35.6 | 36.2 | 60 | 60 | 40 | 40 |
| | | | | | | | 2TP04513658 | 34.0 | 32.7 | 45.4 | 46.0 | 47.6 | 48.3 | 70 | 70 | 50 | 50 |
| | | | | | | | 2HP04515458† | 54.0 | 52.0 | 56.5 | 57.1 | 58.7 | 59.3 | 70 | 70 | 70 | 70 |

* Maximum HACR breaker of the same AMP size is applicable.

## TABLE 17: ELECTRICAL DATA 12-1/2 TON

| Voltage | Compressors | | OD Fan Moto FLA | Blower Motor Supply FLA | | Electric Heater | | | Min. Circuit Ampacity (Amps) | | MCA w/ Power Exhaust (Amps) | | Max Fuse* Size (Amps) | | Max Fuse* Size w/ Power Exhaust* (A MPS | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | MPM PS) | LRA | | 3 HP | 5 HP | Model No. | Rated kW | Heater Amps | 3 HP | 5 HP | 3 HP | 5 HP | 3 HP | 5 HP | 3 HP | 5 HP |
| 208 | 18.9 | 146 | 3.5 | 10.9 | 17.3 | None | - | - | 60.4 | 66.8 | 65.9 | 72.3 | 70 | 80 | 80 | 90 |
| | | | | | | 2TP04511825 | 13.5 | 37.5 | 107.3 | 113.7 | 67.3 | 75.3 | 70 | 80 | 80 | 90 |
| | | | | | | 2TP04512425 | 18.0 | 50.0 | 122.9 | 129.3 | 83.0 | 91.0 | 80 | 90 | 90 | 100 |
| | | | | | | 2TP04513625 | 25.5 | 70.8 | 148.9 | 155.3 | 109.0 | 117.0 | 110 | 125 | 110 | 125 |
| | | | | | | 2HP04505425† | 40.6 | 112.7 | 154.5 | 162.5 | 161.4 | 169.4 | 175 | 175 | 175 | 175 |
| 230 | 18.9 | 146 | 3.5 | 10.9 | 17.3 | None | - | - | 60.4 | 66.8 | 65.9 | 72.3 | 70 | 80 | 80 | 90 |
| | | | | | | 2TP04511825 | 18.0 | 43.3 | 114.6 | 121.0 | 7406 | 85.6 | 70 | 80 | 80 | 90 |
| | | | | | | 2TP04512425 | 24.0 | 57.7 | 132.6 | 139.0 | 92.7 | 100.7 | 90 | 100 | 100 | 110 |
| | | | | | | 2TP04513625 | 34.0 | 81.8 | 162.7 | 169.1 | 122.7 | 130.7 | 125 | 125 | 125 | 150 |
| | | | | | | 2HP04505425† | 54.0 | 129.9 | 162.7 | 169.1 | 150.4 | 158.4 | 175 | 175 | 175 | 175 |
| 460 | 9.5 | 73 | 1.6 | 5.3 | 8.6 | None | - | - | 29.9 | 33.2 | 32.1 | 35.4 | 35 | 40 | 40 | 40 |
| | | | | | | 2TP04511846 | 18.0 | 21.7 | 56.9 | 60.2 | 36.4 | 40.6 | 35 | 40 | 40 | 45 |
| | | | | | | 2TP04512446 | 24.0 | 28.9 | 66.0 | 69.3 | 45.5 | 49.6 | 45 | 50 | 50 | 50 |
| | | | | | | 2TP04513646 | 34.0 | 40.9 | 81.0 | 84.3 | 60.5 | 64.6 | 60 | 70 | 70 | 70 |
| | | | | | | 2HP04515446† | 54.0 | 65.0 | 81.0 | 84.3 | 74.3 | 78.5 | 80 | 90 | 80 | 90 |
| 575 | 7.6 | 58 | 1.3 | 4.1 | 6.8 | None | - | - | 23.8 | 26.5 | 25.6 | 28.3 | 30 | 30 | 30 | 35 |
| | | | | | | 2TP04511858 | 18.0 | 17.3 | 45.5 | 48.2 | 29.0 | 32.4 | 30 | 35 | 30 | 35 |
| | | | | | | 2TP04512458 | 24.0 | 23.1 | 52.7 | 55.4 | 36.2 | 39.6 | 35 | 40 | 40 | 40 |
| | | | | | | 2TP04513658 | 34.0 | 32.7 | 64.7 | 67.4 | 48.3 | 51.6 | 50 | 50 | 50 | 60 |
| | | | | | | 2HP04515458† | 54.0 | 52.0 | 64.7 | 67.4 | 59.3 | 62.7 | 70 | 70 | 70 | 70 |

* Maximum HACR breaker of the same AMP size is applicable.

† Only 34kW of electric heat can be simultaneously energized with the mechanical heating. The full 54kW operates only if both compressors are locked-out.

## TABLE 18: PHYSICAL DATA

| Component | | Models | | | | |
|---|---|---|---|---|---|---|
| | | 078 | 090 | 102 | 120 | 150 |
| **Evaporator Blower** | Blower, Centrifugal (Dia. X Wd. in.) | 15 x 15 | 15 x 15 | 15 x 15 | 15 x 15 | 15 x 15 |
| | Motor, Standard (HP) | 1-1/2 | 1-1/2 | 2 | 2 | 3 |
| | Motor, Optional (HP) | 2 | 2 | 3 | 3 | 5 |
| **Evaporator Coil** | Rows | 3 | 3 | 3 | 4 | 4 |
| | Fins per Inch | 15 | 15 | 15 | 15 | 15 |
| | Height (in.) | 40 | 40 | 40 | 40 | 40 |
| | Face Area ($ft.^2$ each) | 13.2 | 13.2 | 13.2 | 13.2 | 13.2 |
| **Condenser Fan (2 per Unit)** | Propeller Dia. (in., each) | 24 | 24 | 24 | 24 | 24 |
| | Motor (HP, each) | 1/3 | 1/3 | 3/4 | 3/4 | 3/4 |
| | CFM, Nominal (each) | 3400 | 3400 | 4400 | 4400 | 4400 |
| **Condenser Coil (2 per unit)** | Rows (each) | 1 | 2 | 2 | 2 | 2 |
| | Fins per Inch | 20 | 20 | 20 | 20 | 20 |
| | Height (in., each) | 44 | 44 | 44 | 44 | 44 |
| | Face Area ($ft.^2$ each) | 14.5 | 14.5 | 14.5 | 14.5 | 14.5 |
| **Refrigerant Charge** | System 1 (lb./oz.) | 18 | 13/8 | TBD | 15/4 | 12/12 |
| | System 2 (lb./oz.) | N/A | 13/6 | TBD | 15/4 | 12/12 |
| **Compressors** | Quantity | 1 | 2 | 2 | 2 | 2 |
| | Type | Scroll | Recip | Recip | Recip | Scroll |
| **Air Filters** | Size (Wd. x Ht. x Thickness in.) | 25x20x2 | 25x20x2 | 25x20x2 | 25x20x2 | 25x20x2 |
| | Number Per Unit | 4 | 4 | 4 | 4 | 4 |

# ACCESSORIES

## ELECTRIC HEAT

Electric heaters are available for field installation. Refer to electric heat instructions for installation. These heaters mount in the heat compartment with the heating elements extending into the supply air chamber. All electric heaters are fused and intended for use with single point power supply.

## ECONOMIZERS

The downflow economizer can be factory or field installed. If factory installed, refer to the instructions included with the outdoor air hood to complete the assembly. Field installed economizers include complete instructions for installation.

Horizontal economizer is available only as a field installed accessory.

## RAIN HOOD

The following procedure should be used when assembling the economizer rain hood onto a unit. The outdoor and return air dampers, the damper actuator and gears, the outdoor and return air divider baffles, and all chosen control sensors are factory mounted as part of the economizer option.

All of the hood components, including the filters, the gasketing, and the hardware for assembling, are packaged and located between the condenser coil section and the main unit cabinet.

To assemble the rain hood:

1. Remove the hood components, filters, gasketing, and assembly hardware from the area between the coils and main cabinet. Follow the instructions included with the hood to complete the installation.

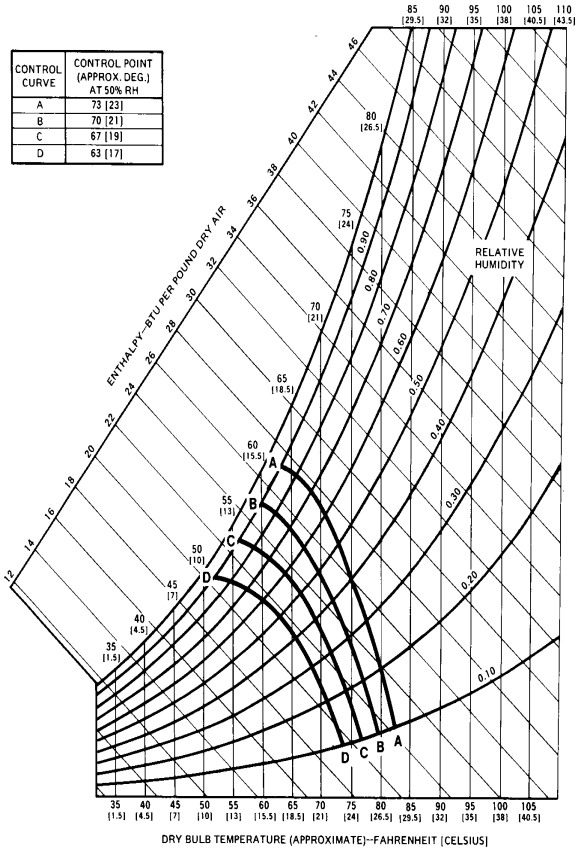



**FIGURE 19 : ENTHALPY SET POINT CHART**

**TABLE 19: ACCESSORY STATIC RESISTANCE***

| Description | External Static Pressure Drop - Resistance, IWG | | | | |
|---|---|---|---|---|---|
| | CFM | | | | |
| | 2250 | 3000 | 4000 | 5000 | 6000 |
| Economizer | 0.03 | 0.03 | 0.04 | 0.07 | 0.09 |

* Deduct these resistance values from the available external static pressure shown in the respective Blower Performance Table.

### SET POINT ADJUSTMENT

> **⚠ CAUTION**
>
> *Extreme care must be exercised in turning both the setpoint and minimum position adjusting screws to prevent twisting them off.*

1. The enthalpy set point for the dampers may now be set by selecting the desired setpoint. Adjust as follows:

- For a single enthalpy carefully turn the set point adjusting screw to the “A”, “B”, “C” or “D” setting corresponding to the lettered curve.
- For a dual enthalpy carefully turn the set point adjusting screw fully clockwise past the “D” setting.

To check that the damper blades move smoothly without binding carefully turn the minimum position adjusting screw fully clockwise and then energize and de-energize terminals “R” to “G”. With terminals “R” to “G” energized, turn the minimum position screw counterclockwise until the desired minimum position has been attained

## START-UP

### PHASING

Predator™ units are properly phased at the factory. Check for proper compressor rotation. If the blower or compressors rotate in the wrong direction at start-up, the electrical connection to the unit is misphased. Change the incoming line connection phasing to obtain proper rotation. (Scroll compressors operate in only one direction. If the scroll is drawing low amperage, has similar suction and discharge pressures, or producing a high noise level, the scroll is misphased). Units with scroll compressors have a phase monitor as standard equipment. This phase monitor will prevent unit operation under misphased conditions by breaking the 24 volt power.

> **⚠ CAUTION**
>
> *Scroll compressors require proper rotation to operate correctly. Units are properly phased at the factory. Do not change the internal wiring to make the blower condenser fans, or compressor rotate correctly.*

### SUPPLY AIR INSTRUCTIONS

#### CHECKING SUPPLY AIR CFM

The RPM of the supply air blower will depend on the required CFM, the accessory static resistance pressure of the unit accessories, and the static pressure resistance of the air duct system. With this information, the RPM for the supply air blower can be determined from the blower performance data (see Tables 23 - 31). Table 32 provides drive information for the sheaves supplied with the unit.

The supply air CFM must be within the limitations shown in Table 20.

### BLOWER ROTATION

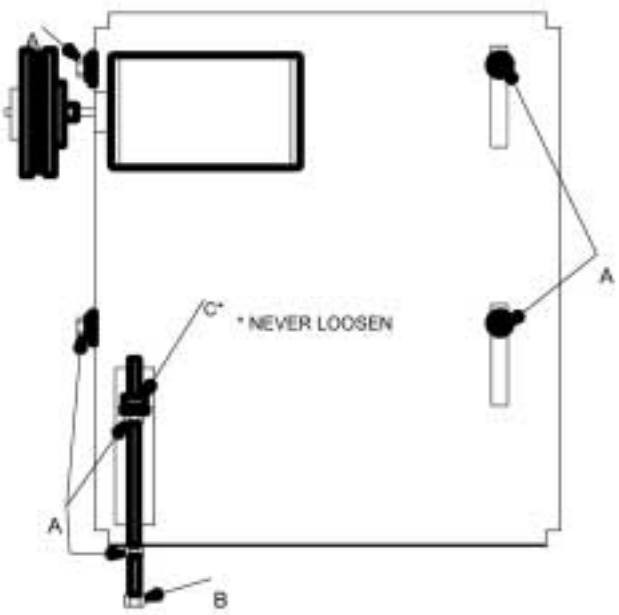
Check for proper supply air blower rotation. If the blower is rotating backwards, the line voltage at the unit point of power connection is misphased (See ‘PHASING’).

### TABLE 20: SUPPLY AIR LIMITATIONS

| Unit Size | Minimum | Maximum |
|---|---|---|
| **078** | 1950 | 3250 |
| **090** | 2250 | 3750 |
| **102** | 2250 | 4250 |
| **120** | 3000 | 5000 |
| **150** | 3750 | 6250 |

### BELT TENSION

The tension on the belt should be adjusted as shown in Figure 20 .



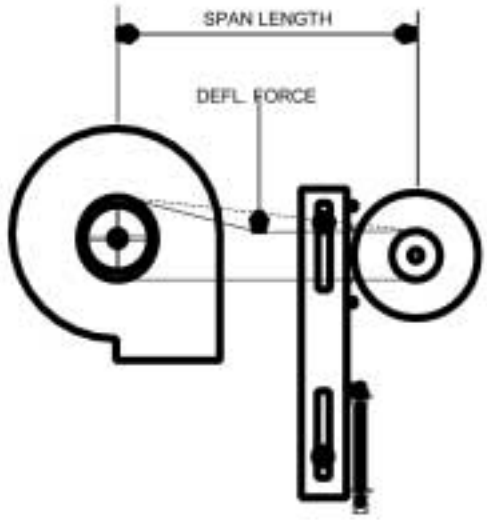




**FIGURE 20 : BELT ADJUSTMENT**

**⚠ CAUTION**

*Procedure for adjusting belt tension:*

*1. Loosen six nuts (top and bottom) A.*

*2. Adjust by turning (B).*

*3. Never loosen nuts (C).*

*4. Use belt tension checker to apply a perpendicular force to one belt at the midpoint of the span as shown. Deflection distance of 4mm (5/32") is obtained.*

*To determine the deflection distance from normal position, use a straight edge from sheave to sheave as reference line. The recommended deflection force is as follows:*

*Tension new belts at the max. deflection force recommended for the belt section. Check the belt tension at least two times during the first 24 hours of operation. Any retensioning should fall between the min. and max. deflection force values.*

*5. After adjusting retighten nuts (A).*

## TABLE 21: 6-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| 0.2 | - | - | - | - | - | - | 3291 | 1191 | 1.28 | 3096 | 1059 | 1.14 | 2963 | 948 | 1.02 | 2757 | 831 | 0.89 |
| 0.4 | - | - | - | 3168 | 1225 | 1.31 | 2969 | 1085 | 1.16 | 2658 | 939 | 1.01 | 2535 | 834 | 0.89 | 2255 | 718 | 0.77 |
| 0.6 | 3223 | 1273 | 1.37 | 2732 | 1084 | 1.16 | 2500 | 947 | 1.02 | 2110 | 803 | 0.86 | 1923 | 699 | 0.75 | 1608 | 596 | 0.64 |
| 0.8 | 2541 | 1091 | 1.17 | 2168 | 925 | 0.99 | 1882 | 793 | 0.85 | - | - | - | - | - | - | - | - | - |
| 1.0 | 1859 | 908 | 0.97 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 22: 6-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| 0.4 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3489 | 1553 | 1.67 |
| 0.6 | - | - | - | - | - | - | - | - | - | - | - | - | 3394 | 1641 | 1.76 | 3101 | 1407 | 1.51 |
| 0.8 | - | - | - | - | - | - | 3623 | 2009 | 2.15 | 3323 | 1742 | 1.87 | 2971 | 1477 | 1.58 | 2607 | 1241 | 1.33 |
| 1.0 | - | - | - | 3643 | 2150 | 2.31 | 3224 | 1820 | 1.95 | 2889 | 1569 | 1.68 | 2466 | 1306 | 1.40 | 2009 | 1071 | 1.15 |
| 1.2 | 3613 | 2238 | 2.40 | 3143 | 1917 | 2.06 | 2748 | 1621 | 1.74 | 2369 | 1385 | 1.49 | 1879 | 1141 | 1.22 | - | - | - |
| 1.4 | 3099 | 2039 | 2.19 | 2636 | 1711 | 1.83 | 2195 | 1424 | 1.53 | - | - | - | - | - | - | - | - | - |
| 1.6 | 2586 | 1833 | 1.97 | 2124 | 1532 | 1.64 | - | - | - | - | - | - | - | - | - | - | - | - |
| 1.8 | 2073 | 1621 | 1.74 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 23: 7-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.2** | - | - | - | 3715 | 1573 | 1.69 | 3634 | 1434 | 1.54 | 3431 | 1265 | 1.36 | 3218 | 901 | 0.97 | 3024 | 976 | 1.05 |
| **0.4** | 3650 | 1657 | 1.78 | 3510 | 1490 | 1.60 | 3320 | 1313 | 1.41 | 3079 | 1145 | 1.23 | 2832 | 810 | 0.87 | 2586 | 860 | 0.92 |
| **0.6** | 3334 | 1522 | 1.63 | 3146 | 1351 | 1.45 | 2910 | 1169 | 1.25 | 2621 | 1005 | 1.08 | 2307 | 706 | 0.76 | - | - | - |
| **0.8** | 2903 | 1352 | 1.45 | 2622 | 1167 | 1.25 | 2404 | 1013 | 1.09 | 2054 | 858 | 0.92 | - | - | - | - | - | - |
| **1.0** | 2356 | 1159 | 1.24 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 24: 7-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W‡ | BHP | CFM | W‡ | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.2** | - | - | - | - | - | - | - | - | - | - | - | - | 3992 | 1904 | 2.04 | 3798 | 1679 | 1.80 |
| **0.4** | - | - | - | - | - | - | - | - | - | 3930 | 2017 | 2.16 | 3734 | 1786 | 1.92 | 3486 | 1552 | 1.66 |
| **0.6** | - | - | - | - | - | - | 3947 | 2176 | 2.33 | 3670 | 1895 | 2.03 | 3394 | 1641 | 1.76 | 3084 | 1401 | 1.50 |
| **0.8** | - | - | - | 4138 | 2384 | 2.56 | 3623 | 2009 | 2.15 | 3323 | 1742 | 1.87 | 2971 | 1477 | 1.58 | 2591 | 1236 | 1.33 |
| **1.0** | 4126 | 2430 | 2.61 | 3643 | 2145 | 2.30 | 3224 | 1820 | 1.95 | 2889 | 1569 | 1.68 | 2466 | 1306 | 1.40 | - | - | - |
| **1.2** | 3613 | 2238 | 2.40 | 3143 | 1921 | 2.06 | 2748 | 1621 | 1.74 | 2369 | 1385 | 1.49 | - | - | - | - | - | - |
| **1.4** | 3099 | 2039 | 2.19 | 2636 | 1714 | 1.84 | 2195 | 1424 | 1.53 | - | - | - | - | - | - | - | - | - |
| **1.6** | 2586 | 1833 | 1.97 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 25: 8-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| 0.2 | - | - | - | 4090 | 1816 | 1.95 | 3872 | 1613 | 1.73 | 3681 | 1448 | 1.55 | 3420 | 1271 | 1.36 | 3217 | 1125 | 1.21 |
| 0.4 | 3783 | 1778 | 1.91 | 3782 | 1685 | 1.81 | 3548 | 1489 | 1.60 | 3334 | 1325 | 1.42 | 3026 | 1149 | 1.23 | 2796 | 1010 | 1.08 |
| 0.6 | 3648 | 1720 | 1.84 | 3387 | 1529 | 1.64 | 3123 | 1340 | 1.44 | 2874 | 1176 | 1.26 | 2495 | 1002 | 1.08 | - | - | - |
| 0.8 | 3317 | 1583 | 1.70 | 2903 | 1354 | 1.45 | 2599 | 1175 | 1.26 | - | - | - | - | - | - | - | - | - |
| 1.0 | 2788 | 1385 | 1.49 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 26: 8-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| 0.4 | - | - | - | - | - | - | - | - | - | 4257 | 2325 | 2.49 | 4117 | 2079 | 2.23 | 3878 | 1816 | 1.95 |
| 0.6 | - | - | - | - | - | - | 4363 | 2596 | 2.78 | 4114 | 2248 | 2.41 | 3876 | 1961 | 2.10 | 3556 | 1676 | 1.80 |
| 0.8 | - | - | - | 4323 | 2776 | 2.98 | 4107 | 2446 | 2.62 | 3838 | 2104 | 2.26 | 3499 | 1788 | 1.92 | 3166 | 1520 | 1.63 |
| 1.0 | 4317 | 2968 | 3.18 | 4175 | 2677 | 2.87 | 3803 | 2276 | 2.44 | 3427 | 1905 | 2.04 | 2987 | 1577 | 1.69 | 2710 | 1355 | 1.45 |
| 1.2 | 4243 | 2918 | 3.13 | 3869 | 2486 | 2.67 | 3451 | 2089 | 2.24 | 2882 | 1669 | 1.79 | - | - | - | - | - | - |
| 1.4 | 3977 | 2743 | 2.94 | 3408 | 2225 | 2.39 | 3051 | 1888 | 2.03 | - | - | - | - | - | - | - | - | - |
| 1.6 | 3518 | 2467 | 2.65 | 2790 | 1927 | 2.07 | 2604 | 1679 | 1.80 | - | - | - | - | - | - | - | - | - |
| 1.8 | 2868 | 2125 | 2.28 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 27: 10 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.2** | - | - | - | - | - | - | - | - | - | 3896 | 1639 | 1.76 | 3688 | 1453 | 1.56 | 3447 | 1268 | 1.36 |
| **0.4** | 4040 | 2076 | 2.23 | 4005 | 1934 | 2.07 | 3790 | 1698 | 1.82 | 3569 | 1508 | 1.62 | 3333 | 1330 | 1.43 | 3057 | 1147 | 1.23 |
| **0.6** | 3890 | 2006 | 2.15 | 3697 | 1790 | 1.92 | 3427 | 1550 | 1.66 | 3152 | 1356 | 1.45 | - | - | - | - | - | - |
| **0.8** | 3620 | 1882 | 2.02 | 3324 | 1629 | 1.75 | 2972 | 1380 | 1.48 | - | - | - | - | - | - | - | - | - |
| **1.0** | 3227 | 1708 | 1.83 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 28: 10 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.4** | 4965 | 3485 | 3.74 | 4875 | 3150 | 3.38 | 4613 | 2739 | 2.94 | 4322 | 2374 | 2.55 | 4156 | 2106 | 2.26 | 3907 | 1860 | 1.99 |
| **0.6** | 4876 | 3416 | 3.66 | 4651 | 2997 | 3.21 | 4359 | 2582 | 2.77 | 4038 | 2220 | 2.38 | 3860 | 1966 | 2.11 | 3590 | 1724 | 1.85 |
| **0.8** | 4713 | 3291 | 3.53 | 4387 | 2823 | 3.03 | 4077 | 2417 | 2.59 | 3719 | 2059 | 2.21 | 3541 | 1827 | 1.96 | 3242 | 1584 | 1.70 |
| **1.0** | 4476 | 3116 | 3.34 | 4084 | 2632 | 2.82 | 3768 | 2245 | 2.41 | 3365 | 1892 | 2.03 | 3197 | 1691 | 1.81 | - | - | - |
| **1.2** | 4165 | 2898 | 3.11 | 3741 | 2427 | 2.60 | 3432 | 2070 | 2.22 | - | - | - | - | - | - | - | - | - |
| **1.4** | 3779 | 2646 | 2.84 | 3359 | 2212 | 2.37 | 3069 | 1895 | 2.03 | - | - | - | - | - | - | - | - | - |
| **1.6** | 3319 | 2372 | 2.54 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 29: 12-1/2 TON STANDARD MOTOR DOWN SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.4** | 5078 | 3630 | 3.89 | 4809 | 3103 | 3.33 | 4594 | 3053 | 3.27 | 4360 | 2478 | 2.66 | 4090 | 2093 | 2.24 | 3812 | 1798 | 1.93 |
| **0.6** | 4865 | 3456 | 3.71 | 4584 | 2961 | 3.17 | 4349 | 2912 | 3.12 | 4106 | 2318 | 2.49 | 3814 | 1964 | 2.11 | - | - | - |
| **0.8** | 4642 | 3284 | 3.52 | 4356 | 2828 | 3.03 | 4089 | 2776 | 2.98 | 3840 | 2137 | 2.29 | - | - | - | - | - | - |
| **1.0** | 4408 | 3114 | 3.34 | 4124 | 2705 | 2.90 | 3815 | 2647 | 2.84 | - | - | - | - | - | - | - | - | - |
| **1.2** | 4164 | 2947 | 3.16 | 3889 | 2592 | 2.78 | - | - | - | - | - | - | - | - | - | - | - | - |
| **1.4** | 3910 | 2787 | 2.99 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 30: 12-1/2 TON OPTIONAL MOTOR DOWN SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.4** | 5994 | 5400 | 5.79 | 5565 | 4369 | 4.69 | 5488 | 4169 | 4.47 | 5264 | 3599 | 3.86 | 4990 | 3085 | 3.31 | 4738 | 2812 | 3.02 |
| **0.6** | 5824 | 5216 | 5.59 | 5368 | 4186 | 4.49 | 5289 | 3991 | 4.28 | 5049 | 3437 | 3.69 | 4763 | 2937 | 3.15 | 4491 | 2655 | 2.85 |
| **0.8** | 5641 | 5022 | 5.39 | 5170 | 4012 | 4.30 | 5076 | 3807 | 4.08 | 4822 | 3272 | 3.51 | 4528 | 2790 | 2.99 | 4235 | 2497 | 2.68 |
| **1.0** | 5444 | 4819 | 5.17 | 4971 | 3846 | 4.12 | 4847 | 3618 | 3.88 | 4584 | 3103 | 3.33 | 4286 | 2644 | 2.83 | 3969 | 2340 | 2.51 |
| **1.2** | 5233 | 4609 | 4.94 | 4771 | 3687 | 3.95 | 4604 | 3426 | 3.67 | 4335 | 2933 | 3.15 | 4035 | 2499 | 2.68 | - | - | - |
| **1.4** | 5009 | 4394 | 4.71 | 4571 | 3537 | 3.79 | 4346 | 3233 | 3.47 | 4074 | 2762 | 2.96 | 3777 | 2356 | 2.53 | - | - | - |
| **1.6** | 4771 | 4174 | 4.48 | 4370 | 3395 | 3.64 | 4074 | 3040 | 3.26 | 3802 | 2590 | 2.78 | - | - | - | - | - | - |
| **1.8** | 4520 | 3951 | 4.24 | 4169 | 3262 | 3.50 | 3786 | 2850 | 3.06 | - | - | - | - | - | - | - | - | - |
| **2.0** | 4255 | 3728 | 4.00 | 3966 | 3137 | 3.36 | - | - | - | - | - | - | - | - | - | - | - | - |
| **2.2** | 3976 | 3505 | 3.76 | 3763 | 3020 | 3.24 | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 31: 6-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| **0.4** | - | - | - | - | - | - | 3367 | 1216 | 1.30 | 3133 | 1067 | 1.14 | 2954 | 944 | 1.01 | 2701 | 819 | 0.88 |
| **0.6** | - | - | - | 3208 | 1239 | 1.33 | 2913 | 1068 | 1.15 | 2466 | 913 | 0.98 | 2350 | 789 | 0.85 | 1750 | 621 | 0.67 |
| **0.8** | - | - | - | 2651 | 1058 | 1.13 | 2317 | 894 | 0.96 | 1656 | 700 | 0.75 | - | - | - | - | - | - |
| **1.0** | 2186 | 998 | 1.07 | 1774 | 830 | 0.89 | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 32: 6-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| **0.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3597 | 1598 | 1.71 |
| **0.8** | - | - | - | - | - | - | - | - | - | - | - | - | 3503 | 1689 | 1.81 | 3172 | 1430 | 1.53 |
| **1.0** | - | - | - | - | - | - | | | | 3406 | 1778 | 1.91 | 3032 | 1497 | 1.61 | 2248 | 1143 | 1.23 |
| **1.2** | - | - | - | - | - | - | 3327 | 1866 | 2.00 | 2926 | 1578 | 1.69 | 2160 | 1217 | 1.31 | - | - | - |
| **1.4** | - | - | - | 3270 | 1971 | 2.11 | 2537 | 1544 | 1.66 | 2043 | 1296 | 1.39 | - | - | - | - | - | - |
| **1.6** | 3196 | 2077 | 2.23 | 2460 | 1651 | 1.77 | 1858 | 1318 | 1.41 | - | - | - | - | - | - | - | - | - |
| **1.8** | 2426 | 1768 | 1.90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 33: 7-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.4** | - | - | - | - | - | - | 3736 | 1476 | 1.58 | 3487 | 1284 | 1.38 | 3231 | 1109 | 1.19 | 3001 | 970 | 1.04 |
| **0.6** | - | - | - | 3572 | 1514 | 1.62 | 3389 | 1339 | 1.44 | 3094 | 1151 | 1.23 | 2764 | 972 | 1.04 | 2446 | 824 | 0.88 |
| **0.8** | 3422 | 1558 | 1.67 | 3179 | 1364 | 1.46 | 2889 | 1164 | 1.25 | 2554 | 985 | 1.06 | - | - | - | - | - | - |
| **1.0** | 2891 | 1347 | 1.44 | 2372 | 1088 | 1.17 | 2050 | 922 | 0.99 | - | - | - | - | - | - | - | - | - |
| **1.2** | 2017 | 1051 | 1.13 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 34: 7-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE*

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.4** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 3910 | 1726 | 1.85 |
| **0.6** | - | - | - | - | - | - | - | - | - | - | - | - | 3857 | 1842 | 1.98 | 3597 | 1430 | 1.53 |
| **0.8** | - | - | - | - | - | - | - | - | - | 3804 | 1957 | 2.10 | 3503 | 1689 | 1.81 | 3172 | 1430 | 1.53 |
| **1.0** | - | - | - | - | - | - | 3774 | 2088 | 2.24 | 3406 | 1778 | 1.91 | 3032 | 1497 | 1.61 | 2248 | 1143 | 1.23 |
| **1.2** | - | - | - | - | - | - | 3327 | 1866 | 2.00 | 2926 | 1578 | 1.69 | 2160 | 1217 | 1.31 | - | - | - |
| **1.4** | - | - | - | 3270 | 1971 | 2.11 | 2537 | 1544 | 1.66 | 2043 | 1296 | 1.39 | - | - | - | - | - | - |
| **1.6** | 3196 | 2077 | 2.23 | 2460 | 1651 | 1.77 | - | - | - | - | - | - | - | - | - | - | - | - |
| **1.8** | 2426 | 1768 | 1.90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 35: 8-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE * †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| **0.4** | - | - | - | 4220 | 1873 | 2.01 | 3991 | 1659 | 1.78 | 3745 | 1468 | 1.57 | 3470 | 1283 | 1.38 | 3209 | 1120 | 1.20 |
| **0.6** | - | - | - | 3887 | 1729 | 1.85 | 3612 | 1514 | 1.62 | 3357 | 1330 | 1.43 | 3013 | 1146 | 1.23 | 2719 | 992 | 1.06 |
| **0.8** | - | - | - | 3516 | 1584 | 1.70 | 3219 | 1372 | 1.47 | 2903 | 2903 | 3.11 | 2343 | 966 | 1.04 | - | - | - |
| **1.0** | 3383 | 1614 | 1.73 | 3023 | 1391 | 1.49 | 2557 | 1161 | 1.25 | - | - | - | - | - | - | - | - | - |
| **1.2** | 2674 | 1341 | 1.44 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 36: 8-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE* †

| ESP‡ | TURNS OPEN** | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP | CFM | W†† | BHP |
| **0.6** | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - | 4068 | 1902 | 2.04 |
| **0.8** | - | - | - | - | - | - | - | - | - | 4306 | 2348 | 2.52 | 4036 | 2050 | 2.20 | 3692 | 1742 | 1.87 |
| **1.0** | - | - | - | - | - | - | 4323 | 2579 | 2.77 | 3967 | 2172 | 2.33 | 3632 | 1848 | 1.98 | 3270 | 1552 | 1.66 |
| **1.2** | - | - | - | - | - | - | 4002 | 2389 | 2.56 | 3613 | 1996 | 2.14 | 3080 | 1613 | 1.73 | 2564 | 1307 | 1.40 |
| **1.4** | - | - | - | 4097 | 2632 | 2.82 | 3691 | 2210 | 2.37 | 2980 | 1706 | 1.83 | - | - | - | - | - | - |
| **1.6** | 4211 | 2896 | 3.11 | 3571 | 2313 | 2.48 | 3003 | 1869 | 2.00 | - | - | - | - | - | - | - | - | - |
| **1.8** | 3776 | 2623 | 2.81 | 2591 | 1849 | 1.98 | - | - | - | - | - | - | - | - | - | - | - | - |
| **2.0** | 2674 | 2038 | 2.19 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance for gas heat includes maximum number of heat tubes available for each tonnage.

† Blower performance includes two-inch throwaway filters.

‡ ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

** "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

†† W = Watts

## TABLE 37: 10 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE

| ESP* | TURNS OPEN† | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W‡ | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.2** | - | - | - | - | - | - | - | - | - | 4368 | 1843 | 1.98 | 4132 | 1624 | 1.74 | 3870 | 1423 | 1.53 |
| **0.4** | - | - | - | 4515 | 2192 | 2.35 | 4213 | 1885 | 2.02 | 4020 | 1692 | 1.81 | 3791 | 1491 | 1.60 | 3499 | 1283 | 1.38 |
| **0.6** | - | - | - | 4192 | 2027 | 2.17 | 3905 | 1741 | 1.87 | 3657 | 1537 | 1.65 | 3383 | 1345 | 1.44 | 3062 | 1149 | 1.23 |
| **0.8** | - | - | - | 3838 | 1858 | 1.99 | 3534 | 1591 | 1.71 | 3236 | 1386 | 1.49 | 2934 | 1202 | 1.29 | - | - | - |
| **1.0** | 3755 | 1942 | 2.08 | 3489 | 1695 | 1.82 | 3081 | 1425 | 1.53 | - | - | - | - | - | - | - | - | - |
| **1.2** | 3337 | 1757 | 1.88 | 2918 | 1475 | 1.58 | - | - | - | - | - | - | - | - | - | - | - | - |

* ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

† "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

‡ W = Watts

## TABLE 38: 10 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE*

| ESP† 3 | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| **0.2** | - | - | - | - | - | - | - | - | - | - | - | - | 5067 | 2614 | 2.80 | 4809 | 2290 | 2.46 |
| **0.4** | - | - | - | - | - | - | 5179 | 3112 | 3.34 | 4884 | 2703 | 2.90 | 4729 | 2401 | 2.57 | 4459 | 2113 | 2.27 |
| **0.6** | - | - | - | - | - | - | 4925 | 2943 | 3.16 | 4585 | 2521 | 2.70 | 4429 | 2244 | 2.41 | 4137 | 1964 | 2.11 |
| **0.8** | - | - | - | 4974 | 3220 | 3.45 | 4607 | 2727 | 2.92 | 4267 | 2342 | 2.51 | 4099 | 2080 | 2.23 | 3783 | 1809 | 1.94 |
| **1.0** | 4975 | 3453 | 3.70 | 4657 | 2995 | 3.21 | 4305 | 2550 | 2.73 | 3941 | 2171 | 2.33 | 3751 | 1919 | 2.06 | 3371 | 1630 | 1.75 |
| **1.2** | 4679 | 3423 | 3.67 | 4366 | 2808 | 3.01 | 4022 | 2373 | 2.54 | 3545 | 1978 | 2.12 | 3305 | 1741 | 1.87 | - | - | - |
| **1.4** | 4429 | 3065 | 3.29 | 4040 | 2607 | 2.80 | 3669 | 2673 | 2.87 | 2918 | 1700 | 1.82 | - | - | - | - | - | - |
| **1.6** | 4107 | 2845 | 3.05 | 3620 | 2357 | 2.53 | 2931 | 1830 | 1.96 | - | - | - | - | - | - | - | - | - |
| **1.8** | 3553 | 2500 | 2.68 | 2756 | 1899 | 2.04 | - | - | - | - | - | - | - | - | - | - | - | - |
| **2.0** | 2439 | 1939 | 2.08 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 39: 12-1/2 TON STANDARD MOTOR SIDE SHOT BLOWER PERFORMANCE *

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| 0.4 | - | - | - | - | - | - | 5201 | 3162 | 3.39 | 4966 | 2796 | 3.00 | 4681 | 2405 | 2.58 | 4355 | 2054 | 2.20 |
| 0.6 | - | - | - | 5220 | 3395 | 3.64 | 4942 | 2980 | 3.20 | 4657 | 2608 | 2.80 | 4358 | 2230 | 2.39 | 4007 | 1890 | 2.03 |
| 0.8 | - | - | - | 4944 | 3194 | 3.43 | 4661 | 2806 | 3.01 | 4378 | 2572 | 2.76 | 4016 | 2057 | 2.21 | - | - | - |
| 1.0 | 5003 | 3490 | 3.74 | 4647 | 2988 | 3.20 | 4380 | 2636 | 2.83 | 4030 | 2257 | 2.42 | - | - | - | - | - | - |
| 1.2 | 4724 | 3290 | 3.53 | 4363 | 2875 | 3.08 | 4012 | 2505 | 2.69 | - | - | - | - | - | - | - | - | - |
| 1.4 | 4428 | 3040 | 3.26 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

## TABLE 40: 12-1/2 TON OPTIONAL MOTOR SIDE SHOT BLOWER PERFORMANCE*

| ESP† | TURNS OPEN‡ | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0 | | | 1 | | | 2 | | | 3 | | | 4 | | | 5 | | |
| | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP | CFM | W** | BHP |
| 0.4 | - | - | - | 6447 | 5315 | 5.70 | 6207 | 4760 | 5.1046 | 5966 | 4205 | 4.51 | 5717 | 3716 | 3.98 | 5470 | 3307 | 3.55 |
| 0.6 | - | - | - | 6110 | 4917 | 5.27 | 5965 | 4464 | 4.79 | 5740 | 4023 | 4.31 | 5430 | 3501 | 3.75 | 5126 | 3054 | 3.28 |
| 0.8 | - | - | - | 5772 | 4519 | 4.85 | 5741 | 4274 | 4.58 | 5503 | 3821 | 4.10 | 5162 | 3294 | 3.53 | 4849 | 2870 | 3.08 |
| 1.0 | 6235 | 5521 | 5.92 | 5628 | 4407 | 4.73 | 5474 | 4048 | 4.34 | 5244 | 3611 | 3.87 | 4882 | 3101 | 3.33 | 4530 | 2667 | 2.86 |
| 1.2 | 5881 | 5137 | 5.51 | 5384 | 4205 | 4.51 | 5248 | 3854 | 4.13 | 4941 | 3387 | 3.63 | 4589 | 2906 | 3.12 | 4225 | 2502 | 2.68 |
| 1.4 | 5695 | 4950 | 5.31 | 5123 | 3996 | 4.29 | 5014 | 3670 | 3.94 | 4651 | 3178 | 3.41 | 4284 | 2716 | 2.91 | 3858 | 2280 | 2.45 |
| 1.6 | 5471 | 4728 | 5.07 | 4919 | 3828 | 4.11 | 4732 | 3460 | 3.71 | 4365 | 2983 | 3.20 | 3951 | 2516 | 2.70 | 3491 | 2058 | 2.21 |
| 1.8 | 5242 | 4514 | 4.84 | 4656 | 3611 | 3.87 | 4438 | 3240 | 3.47 | 3998 | 2740 | 2.94 | 3618 | 2316 | 2.48 | - | - | - |
| 2.0 | 4954 | 4231 | 4.54 | 4339 | 3380 | 3.62 | 3905 | 2861 | 3.07 | 3631 | 2497 | 2.68 | - | - | - | - | - | - |
| 2.2 | 4585 | 3934 | 4.22 | 4022 | 3149 | 3.38 | - | - | - | - | - | - | - | - | - | - | - | - |
| 2.4 | 4217 | 3637 | 3.90 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |
| 2.6 | 3848 | 3340 | 3.58 | - | - | - | - | - | - | - | - | - | - | - | - | - | - | - |

* Blower performance includes two-inch throwaway filters.

† ESP (External Static Pressure) given is that available for the supply and return air duct system. All internal resistances have been deducted from the total static pressure of the blower.

‡ "Turns Open" refers to the setting of the variable pitch motor sheave, where "0 Turns Open" is fully closed.

** W = Watts

**TABLE 41: INDOOR BLOWER SPECIFICATIONS**

| MODEL | MOTOR | | | | | MOTOR SHEAVE | | | BLOWER SHEAVE | | | BELT |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | HP | RPM | Eff. | SF | Frame | Datum Dia. (in.) | Bore (in.) | Model | Datum Dia. (in.) | Bore (in.) | Model | |
| BP078 | 1-1/2 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 9.5 | 1 | AK99 | A58 |
| | 2 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 7.5 | 1 | AK79 | A55 |
| BP090 | 1-1/2 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 9.0 | 1 | AK94 | A57 |
| | 2 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 7.5 | 1 | AK79 | A55 |
| BP102 | 2 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 9.0 | 1 | AK94 | A56 |
| | 3 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 7.0 | 1 | AK74 | A54 |
| BP120 | 2 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 8.5 | 1 | AK89 | A56 |
| | 3 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 7.0 | 1 | AK74 | A54 |
| BP150 | 3 | 1725 | 80% | 1.15 | 56 | 3.4 - 4.4 | 7/8 | 1VM50 | 7.0 | 1 | AK74 | A54 |
| | 5 | 1725 | 87% | 1.15 | 184T | 4.3 - 5.3 | 1 1/8 | 1VP56 | 6.7 | 1 | BK77 | BX56 |

## AIR BALANCE

Start the supply air blower motor. Adjust the resistances in both the supply and the return air duct systems to balance the air distribution throughout the conditioned space. The job specifications may require that this balancing be done by someone other than the equipment installer.

### SUPPLY AIR DRIVE ADJUSTMENT

**⚠ WARNING**

*Failure to properly adjust the total system air quantity can result in extensive blower damage.*

**⚠ CAUTION**

*Before making any blower speed changes review the installation for any installation errors, leaks or undesirable systems effects that can result in loss of airflow.*

*Even small changes in blower speed can result in substantial changes in static pressure and BHP. BHP and AMP draw of the blower motor will increase by the cube of the blower speed. Static pressure will increase by the square of the blower speed. Only qualified personnel should make blower speed changes, strictly adhering to the fan laws.*

At unit start-up, the measured CFM may be higher or lower than the required CFM. To achieve the required CFM, the speed of the drive may have adjusted by changing the datum diameter (DD) of the variable pitch motor sheave as described below:

$$\left(\frac{\text{Specified CFM}}{\text{Measured CFM}}\right) \bullet \text{Existing DD} = \text{New DD}$$

Use the following tables and the DD calculated per the above equation to adjust the motor variable pitch sheave.

EXAMPLE

A 10 ton unit was selected to deliver 4,000 CFM with a 5 HP motor, but the unit is delivering 3,750 CFM. The variable pitch motor sheave is set at 2 turns open.

Use the equation to determine the required DD for the new motor sheave,

$$\left(\frac{4{,}000\ \text{CFM}}{3{,}750\ \text{CFM}}\right) \bullet 4.0\ \text{in.} = 4.26\ \text{in.}$$

Use Table 42 to locate the DD nearest to 4.26 in. Close the sheave to 1/2 turn open.

New BHP

$$= (\text{Speed increase})^3 \bullet \text{BHP at 3,750 CFM}$$

$$= (\text{Speed increase})^3 \bullet \text{Original BHP}$$

$$= \text{New BHP}$$

New motor Amps

$$= (\text{Speed increase})^3 \bullet \text{Amps at 3,750 CFM}$$

$$= (\text{Speed increase})^3 \bullet \text{Orignial Amps}$$

$$= \text{New Amps}$$

**TABLE 42: MOTOR SHEAVE DATUM DIAMETERS**

| 1VM50x7/8 (1-1/2, 2 & 3 HP Motor) | | 1VP56x1-1/8 (5 HP Motor) | |
|---|---|---|---|
| **Turns Open** | **Datum Diameter** | **Turns Open** | **Datum Diameter** |
| **0** | 4.4 | **1** | 5.3 |
| **1/2** | 4.3 | **1-1/2** | 5.2 |
| **1** | 4.2 | **2** | 5.1 |
| **1-1/2** | 4.1 | **2-1/2** | 5.0 |
| **2** | 4.0 | **3** | 4.9 |
| **2-1/2** | 3.9 | **3-1/2** | 4.8 |
| **3** | 3.8 | **4** | 4.7 |
| **3-1/2** | 3.7 | **4-1/2** | 4.6 |
| **4** | 3.6 | **5** | 4.5 |
| **4-1/2** | 3.5 | **5-1/2** | 4.4 |
| **5** | 3.4 | **6** | 4.3 |

# COOLING OPERATION INSTRUCTIONS

## COOLING SYSTEM PRELIMINARY OPERATION

After installation has been completed, energize the crankcase heaters for at least four hours before operating unit. After this initial warm-up, the compressors should be given three false starts (energized just long enough to make a few revolutions) with 5-7 minutes of delay between each start before being put into full time service.

**NOTE:** Prior to each cooling season, the crankcase heaters must be energized at least 10 hours before the system is put into operation.

## TURN ON THE POWER TO THE UNIT

1. Set the room thermostat setting to lower than the room temperature.
2. Fist stage compressors will energize after the built-in time delay.
3. The second stage of the thermostat will energize second stage compressor if needed.

# POST START CHECK LIST

### VERIFY PROPER SYSTEM PRESSURES FOR BOTH CIRCUITS

1. Check the unit air flower (CFM). See “SUPPLY AIR DRIVE ADJUSTMENT” on page 32.
2. Measure the temperature drop across the evaporator coil.
3. Check the voltage input.
4. Measure the system Amperage draw across all legs of 3 phase power wires.
5. Measure the condenser fan amps draw.
6. Measure evaporator fan motor’s amp draw.

### SHUT DOWN

1. Set the thermostat to highest temperature setting.
2. Turn off the electrical power to the unit.

# SEQUENCE OF OPERATIONS

## OVERVIEW

For the Predator™ series of units, the thermostat makes a circuit between “R” “Y1” for the first stage of cooling.

The call is passed to the unit control board (UCB), which then determines whether the requested operation is available and, if so, which components to energize.

For heating, the UCB monitors the “W1” call but does not handle the operation of the unit. A “W1” signal energizes a separate relay (RY1) that brings on the unit in the heating mode. A time/temperature control operates the defrost cycle. For electric heat units, the UCB passes the call to the electric heater. In both cases, when the “W1” call is sensed, the indoor air blower is energized following a specified heating delay.

If at any time a call for both heating and cooling are present, the heating operation will be performed. If operating, the cooling system is halted as with a completion of a call for cooling. Heating always takes priority.

## SAFETY CONTROLS

The Predator™ unit control board monitors the following inputs for each cooling system:

1. A suction line freezestat to protect against low evaporator temperatures due to a low airflow or a low return air temperature, (opens at 26 ± 5 °F and resets at 38 ± 5 °F).
2. A high-pressure switch to protect against excessive discharge pressures due to a blocked condenser coil or a condenser motor failure, (opens at 405 ± 10 psig and resets at 300 ± 10 psig).
3. A low-pressure switch to protect against loss of refrigerant charge, (opens at 7 ± 3 psig and resets at 22 ± 5 psig).

The refrigeration systems are independently monitored and controlled. On any fault, only the associated system will be effected by any safety/preventive action. The other refriger-

ant system will continue in operation unless it is effected by the fault as well.

The unit control board monitors the temperature limit switch of electric heat units.

## PROTECTION

The compressors also have inherent (internal) protection. If there is an abnormal temperature rise in a compressor, the protector will open to shut down the compressor.

The unit control board (UCB) incorporates features to minimize compressor wear and damage. An anti-short cycle delay (ASCD) is utilized to prevent operation of a compressor too soon after its previous run. Additionally, a minimum run time is imposed any time a compressor is energized.

The ASCD is initiated on unit start-up and on any compressor reset or lock-out.

## CONTINUOUS BLOWER

By setting the room thermostat to “ON,” the supply air blower will operate continuously.

## INTERMITTENT BLOWER

With the room thermostat fan switch set to “AUTO” and the system switch set to either the “AUTO” or “HEAT” settings, the blower is energized whenever a cooling or heating operation is requested. The blower is energized after any specified delay associated with the operation.

When energized, the indoor blower has a minimum run time of 30 seconds. Additionally, the indoor blower has a delay of 10 seconds between operations.

## COOLING SEQUENCE OF OPERATION

When the thermostat calls for the first stage of cooling, the low-voltage control circuit from “R” to “Y1” and “G” is completed. The UCB energizes the economizer (if installed and free cooling is available) or the first available compressor* and the condenser fans. For first stage cooling, compressor #1 is energized. If compressor #1 is unavailable, compressor #2 is energized (if applicable). After completing the specified fan on delay for cooling, the UCB will energize the blower motor.

When the thermostat calls for the second stage of cooling, the low-voltage control circuit from “R” to “Y2” is completed. The control board energizes the first available compressor. If free cooling is being used for the first stage of cooling, compressor #1 is energized. If compressor #1 is active for first stage cooling or the first compressor is locked-out, compressor (if applicable). In free-cooling mode, if the call for the second stage of cooling continues for 20 minutes, compressor #2 is energized, provided it has not been locked-out.

If there is an initial call for both stages of cooling, the UCB will delay energizing compressor #2 by 30 seconds in order to avoid a power rush. (The 6-1/2 ton unit has only one compressor).

Once the thermostat has been satisfied, the it will de-energize Y1 and Y2. If the compressors have satisfied their minimum run times, the compressors and condenser fans are de-energized. Otherwise, the unit operates each cooling system until the minimum run times for the compressors have been completed. Upon the final compressor de-energizing, the blower is stopped following the elapse of the fan off delay for cooling.

To be available, a compressor must not be locked-out due to a high or low-pressure switch or freezestat trip and the anti-short cycle delay (ASCD) must have elapsed.

## COOLING OPERATION ERRORS

Each cooling system is monitored for operation outside of the intended parameters. Errors are handled as described below. All system errors override minimum run times for compressors.

### HIGH-PRESSURE LIMIT SWITCH

During cooling operation, if a high-pressure limit switch opens, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a high-pressure switch open three times within two hours of operation, the UCB will lock-out the associated compressor and flash a code (see Table 47). If the other compressor is inactive, the condenser fans will be de-energized.

### LOW-PRESSURE LIMIT SWITCH

The low-pressure limit switch is not monitored during the initial 30 seconds of a cooling system’s operation. For the following 30 seconds, the UCB will monitor the low-pressure switch to ensure it closes. If the low-pressure switch fails to close after the 30-second monitoring phase, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

Once the low-pressure switch has been proven (closed during the 30-second monitor period described above), the UCB will monitor the low-pressure limit switch for any openings. If the low-pressure switch opens for greater than 5 seconds, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans.

If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a low-pressure switch open three times within one hour of operation, the UCB will lock-out the associated compressor and flash a code (Table 47). If the other compressor is inactive, the condenser fans will be de-energized.

### FREEZESTAT

During cooling operation, if a freezestat opens, the UCB will de-energize the associated compressor, initiate the ASCD, and, if the other compressor is idle, stop the condenser fans. If the call for cooling is still present at the conclusion of the ASCD, the UCB will re-energize the halted compressor.

Should a freezestat open three times within two hours of operation, the UCB will lock-out the associated compressor and flash a code (Table 47). If the other compressor is inactive, the condenser fans will be de-energized.

### FLASH CODES

When the UCB has locked-out a compressor, the UCB will initiate a flash code associated with the error. Also, if the thermostat is so equipped, the UCB will energize the thermostat trouble light.

### RESET

Remove the call for cooling, by raising thermostat setting higher than the space temperature. This resets any pressure or freezestat flash codes.

## LOW AMBIENT COOLING

To determine when to operate in low ambient mode, the UCB has a pair of terminals connected to a temperature-activated switch. When the low ambient switch is closed and the thermostat is calling for cooling, the UCB will operate in the low ambient mode.

Low ambient mode operates the compressors in this manner: 10 minutes on, 5 minutes off. The indoor blower is operated throughout the cycle. The 5-minute off period is necessary to defrost the indoor coil.

Low ambient mode always begins with compressor operation. Compressor minimum run time may extend the minutes of compressor operation. The defrost cycle will begin immediately following the elapse of the minimum run time.

When operating in low ambient mode, the UCB will not lock-out the compressors due to a freezestat trip. However, a freezestat trip will de-energize the associated compressor. If the call for cooling is still present at the end of the ASCD and the freezestat has closed, the unit will resume operation.

## SUPERHEAT CHARGING METHOD

(Use this method if the unit is equipped with an orifice-type metering device). To determine if the system is properly charged, connect a gauge set to the high and low service ports in the compressor compartment. A temperature probe should be attached to the suction line near the compressor so that suction superheat can be calculated. The probe must be insulated so the higher surrounding temperatures will not affect the reading. A measurement of the outdoor ambient and the indoor wet bulb temperature is also required. (When using a digital temperature probe it is not necessary to insulate the probe because only the probe “tip” is used for sensing.)

Operate system until temperatures and pressures stabilize (minimum of 15 minutes). Then measure and record indoor wet bulb (WB) temperature at the indoor coil. Insert a thermometer with a “wet sock” attached to it into the coil section. Record the outdoor dry bulb (DB) temperature using a thermometer.

Measure and record the suction pressure at the suction service port. Using the Superheat table, note the superheat value corresponding to the intersection of the indoor wet bulb and the outdoor dry bulb. With the superheat value obtained from the table and the suction pressure value previously recorded, find the intersection of the values in Suction Tube Temperature Table. This is the required suction tube temperature at the suction service valve.

To bring the tube temperature in line with the required value, add refrigerant to the service port to cause the tube temperature to fall and reclaim refrigerant to cause the temperature to rise

## TABLE 43: SUPERHEAT CHARGING

| SUCTION PRESSURE PSIG (Service Port) | SUCTION TUBE TEMPERATURE | | | | | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | 0* | 2 | 4 | 6 | 8 | 10 | 12 | 14 | 16 | 18 | 20 | 22 | 24 | 26 | 28 | 30 | 32 | 34 |
| **61.5** | 35 | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 |
| **64.2** | 37 | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 |
| **67.1** | 39 | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 |
| **70** | 41 | 43 | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 |
| **73** | 43 | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 63 | 67 | 69 | 71 | 73 | 75 | 77 |
| **76** | 45 | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 | 77 | 79 |
| **79.2** | 47 | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 | 77 | 79 | 81 |
| **82.4** | 49 | 51 | 53 | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 | 77 | 79 | 81 | 83 |
| **84.1** | 50 | 52 | 54 | 56 | 58 | 60 | 62 | 64 | 66 | 68 | 70 | 72 | 74 | 76 | 78 | 80 | 82 | 84 |
| **92.6** | 55 | 57 | 59 | 71 | 73 | 65 | 67 | 69 | 71 | 73 | 75 | 77 | 79 | 81 | 83 | 85 | 87 | 89 |

* From TMP chart.

## TABLE 44: COOLING SUPERHEAT 6-1/2 & 7-1/2 TON HEAT PUMP

| OUTDOOR TEMP °F | SUCTION SUPERHEAT °F | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | INDOOR WB TEMP °F | | | | | | | | | | |
| | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 |
| **65** | 34.5 | 34.8 | 35.1 | 35.4 | 35.6 | 35.9 | 36.2 | 37.0 | 37.7 | 38.5 | 39.2 |
| **70** | 32.5 | 32.9 | 33.3 | 33.7 | 34.1 | 34.5 | 34.9 | 35.8 | 36.7 | 37.5 | 38.4 |
| **75** | 30.4 | 31.0 | 31.5 | 32.0 | 32.5 | 33.0 | 33.6 | 34.6 | 35.6 | 36.6 | 37.6 |
| **80** | 28.4 | 29.0 | 29.7 | 30.3 | 30.9 | 31.6 | 32.2 | 33.4 | 34.5 | 35.7 | 36.8 |
| **85** | 26.3 | 27.1 | 27.9 | 28.6 | 29.4 | 30.1 | 30.9 | 32.2 | 33.5 | 34.7 | 36.0 |
| **90** | 22.0 | 23.0 | 23.9 | 24.9 | 25.8 | 26.8 | 27.8 | 29.5 | 31.2 | 33.0 | 34.7 |
| **95** | 17.7 | 18.9 | 20.0 | 21.2 | 22.3 | 23.5 | 24.6 | 26.8 | 29.0 | 31.2 | 33.4 |
| **100** | 13.9 | 14.9 | 15.9 | 17.0 | 18.0 | 19.0 | 20.1 | 22.5 | 24.9 | 27.3 | 29.8 |
| **105** | 10.0 | 10.9 | 11.8 | 12.8 | 13.7 | 14.6 | 15.5 | 18.2 | 20.8 | 23.5 | 26.1 |
| **110** | 6.2 | 7.0 | 7.8 | 8.6 | 9.4 | 10.2 | 11.0 | 13.8 | 16.7 | 19.6 | 22.5 |
| **115** | - | - | - | - | 5.0 | 5.7 | 6.4 | 9.5 | 12.6 | 15.8 | 18.9 |

## TABLE 45: COOLING SUPERHEAT 8-1/2 & 10 TON HEAT PUMP

| OUTDOOR TEMP °F | SUCTION SUPERHEAT °F | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | INDOOR WB TEMP °F | | | | | | | | | | |
| | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 |
| 65 | 29.9 | 31.5 | 33.1 | 34.7 | 36.3 | 37.9 | 39.5 | 39.5 | 39.5 | 39.5 | 39.5 |
| 70 | 25.5 | 27.1 | 28.7 | 30.4 | 32.0 | 33.6 | 35.2 | 35.8 | 36.3 | 36.9 | 37.5 |
| 75 | 21.1 | 22.8 | 24.4 | 26.0 | 27.7 | 29.3 | 31.0 | 32.1 | 33.2 | 34.3 | 35.4 |
| 80 | 16.7 | 18.4 | 20.0 | 21.7 | 23.4 | 25.1 | 26.7 | 28.4 | 30.0 | 31.7 | 33.4 |
| 85 | 12.3 | 14.0 | 15.7 | 17.4 | 19.1 | 20.8 | 22.5 | 24.7 | 26.9 | 29.1 | 31.3 |
| 90 | 12.0 | 13.4 | 14.8 | 16.2 | 17.6 | 19.0 | 20.4 | 22.4 | 24.4 | 26.4 | 28.4 |
| 95 | 11.6 | 12.8 | 13.9 | 15.0 | 16.1 | 17.2 | 18.3 | 20.1 | 21.9 | 23.6 | 25.4 |
| 100 | 8.9 | 9.7 | 10.6 | 11.4 | 12.2 | 13.0 | 13.9 | 15.5 | 17.1 | 18.7 | 20.3 |
| 105 | 6.2 | 6.7 | 7.3 | 7.8 | 8.3 | 8.9 | 9.4 | 10.9 | 12.3 | 13.8 | 15.3 |
| 110 | - | - | - | - | - | - | - | 6.3 | 7.6 | 8.9 | 10.2 |
| 115 | - | - | - | - | - | - | - | - | - | - | 5.1 |

## TABLE 46: COOLING SUPERHEAT 12.5 TON HEAT PUMP

| OUTDOOR TEMP °F | SUCTION SUPERHEAT °F | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|
| | INDOOR WB TEMP °F | | | | | | | | | | |
| | 55 | 57 | 59 | 61 | 63 | 65 | 67 | 69 | 71 | 73 | 75 |
| 65 | 10.2 | 12.3 | 14.4 | 16.4 | 18.5 | 20.5 | 22.6 | 24.9 | 27.2 | 29.4 | 31.7 |
| 70 | 9.6 | 11.5 | 13.3 | 15.2 | 17.1 | 18.9 | 20.8 | 23.3 | 25.8 | 28.3 | 30.8 |
| 75 | 9.0 | 10.7 | 12.3 | 14.0 | 15.7 | 17.4 | 19.0 | 21.7 | 24.4 | 27.2 | 29.9 |
| 80 | 8.3 | 9.8 | 11.3 | 12.8 | 14.3 | 15.8 | 17.3 | 20.2 | 23.1 | 26.0 | 28.9 |
| 85 | 7.7 | 9.0 | 10.3 | 11.6 | 12.9 | 14.2 | 15.5 | 18.6 | 21.7 | 24.9 | 28.0 |
| 90 | 7.3 | 8.3 | 9.2 | 10.1 | 11.0 | 11.9 | 12.8 | 15.9 | 19.0 | 22.0 | 25.1 |
| 95 | 7.0 | 7.5 | 8.0 | 8.6 | 9.1 | 9.6 | 10.2 | 13.2 | 16.2 | 19.2 | 22.2 |
| 100 | 6.3 | 6.8 | 7.2 | 7.7 | 8.1 | 8.6 | 9.0 | 11.7 | 14.3 | 16.9 | 19.5 |
| 105 | 5.6 | 6.0 | 6.4 | 6.8 | 7.2 | 7.5 | 7.9 | 10.1 | 12.3 | 14.6 | 16.8 |
| 110 | - | 5.3 | 5.6 | 5.9 | 6.2 | 6.5 | 6.8 | 8.6 | 10.4 | 12.2 | 14.0 |
| 115 | - | - | - | - | 5.2 | 5.5 | 5.7 | 7.1 | 8.5 | 9.9 | 11.3 |

## NORMAL MAINTENANCE

**⚠ CAUTION**

*Prior to any of the following maintenance procedures, shut off all power to the unit to prevent personal injury.*

## GENERAL

### FILTERS

Inspect once a month. Replace disposable or clean permanent type as necessary. DO NOT replace permanent type with disposable.

### MOTORS

Indoor fan and outdoor fan motors are permanently lubricated and require no maintenance.

### OUTDOOR COIL

Dirt should not be allowed to accumulate on the outdoor coil surface or other parts in the air circuit. Cleaning should be as often as necessary to keep coil clean. Use a brush, vacuum cleaner attachment, or other suitable means. If water is used to clean coil, be sure power to the unit is shut off prior to cleaning. Service access is provided in the front and rear condenser compartment panels to provide improved access to the condenser coils.

**⚠ WARNING**

*Do not remove service panels or attempt to clean the interior of the condenser section when the unit is powered and/or operating. Shut off all power to the unit prior to cleaning or maintenance of the condenser section coils*

**NOTE:** Exercise care when cleaning the coil so that the coil fins are not damaged. Do not permit the outdoor air discharge to be obstructed by overhanging structures of shrubs.

## TROUBLESHOOTING

**⚠ CAUTION**

*Label all wires prior to disconnection when servicing controls. Wiring errors can cause improper and dangerous operation which could cause injury to person and/or damage unit components. Verify proper operation after servicing.*

**⚠ WARNING**

*Troubleshooting of components may require opening the electrical control box with the power connected to the unit.* ***Use extreme care when working with live circuits!*** *Check the unit nameplate for the correct line voltage and set the voltmeter to the correct range before making any connections with line terminals. When not necessary, shut off all electric power to the unit prior to any of the following maintenance procedures so as to prevent personal injury.*

## PREDATOR FLASH CODES

Various flash codes are utilized by the unit control board (UCB) to aid troubleshooting. Flash codes are distinguished by the short on and off cycle used (approximately 200ms on and 200ms off). To show normal operation, the control board flashes a one second on, one second off “heartbeat” during normal operation. This is to verify that the UCB is functioning correctly. Do not confuse this with an error flash code. To prevent confusion, a 1-flash, flash code is not used.

Current alarms are flashed on the UCB LED. The alarm history can be checked by pressing and releasing the ALARMS button on the UCB. The UCB will cycle through the last five (5) alarms, most recent to oldest, separating each alarm flash code by approximately 2 seconds.

In some cases, it may be necessary to “zero” the ASCD for the compressors in order to perform troubleshooting. To reset all ASCDs for one cycle, press and release the UCB TEST button once.

### TABLE 47: UNIT CONTROL BOARD FLASH CODES

| Flash Code | Description |
|---|---|
| On Steady | Control Failure - Replace Control |
| Heart Beat | Normal Operation |
| 1 Flash | Not Applicable |
| 2 Flashes | Control Waiting ASCD* |
| 3 Flashes | HPS1 - Compressor Lock out |
| 4 Flashes | HPS2 - Compressor Lock out |
| 5 Flashes | LPS1 - Compressor Lock out |
| 6 Flashes | LPS2 - Compressor Lock out |
| 7 Flashes | FS1 - Compressor Lock out |
| 8 Flashes | FS2 - Compressor Lock out |
| 9 Flashes | No Voltage At MV On Relay Board / Electric Heat Limit Trip / No Jumper Plug in Heat Section |
| 10 Flashes | Compressors Locked Out On Low Outdoor Air Temperature* |
| 11 Flashes | Compressors Locked Out Because The Economizer Is Using Free Cooling* |
| 12 Flashes | Fan Overload Switch Trip - Not Applicable On This Unit |
| 13 Flashes | Compressor Held Off Due To Low Voltage* |
| 14 Flashes | EEPROM Storage Failure (Control Failure) |
| OFF | No Power or Control Failure |

* These flash codes do not represent alarms.

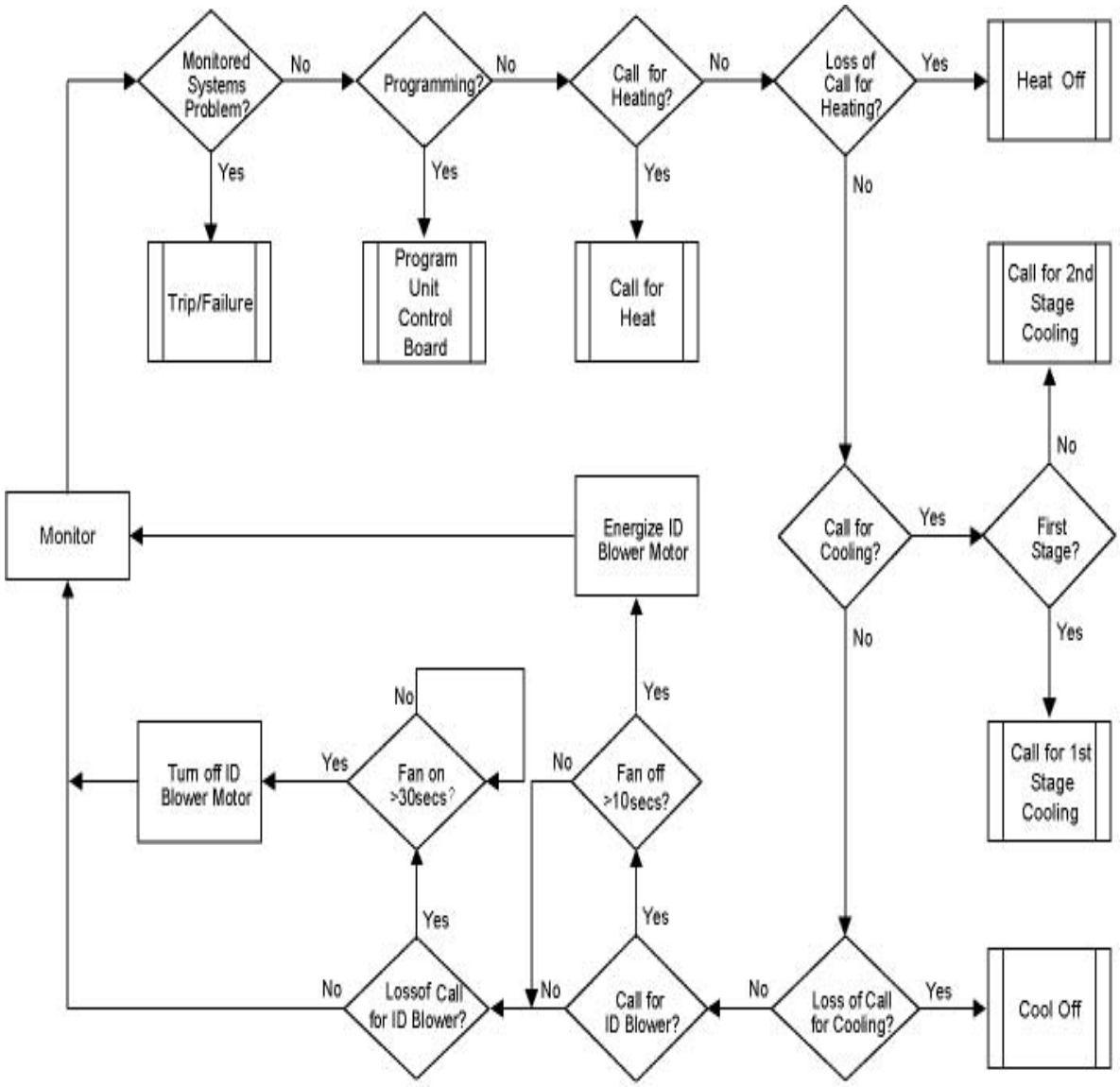
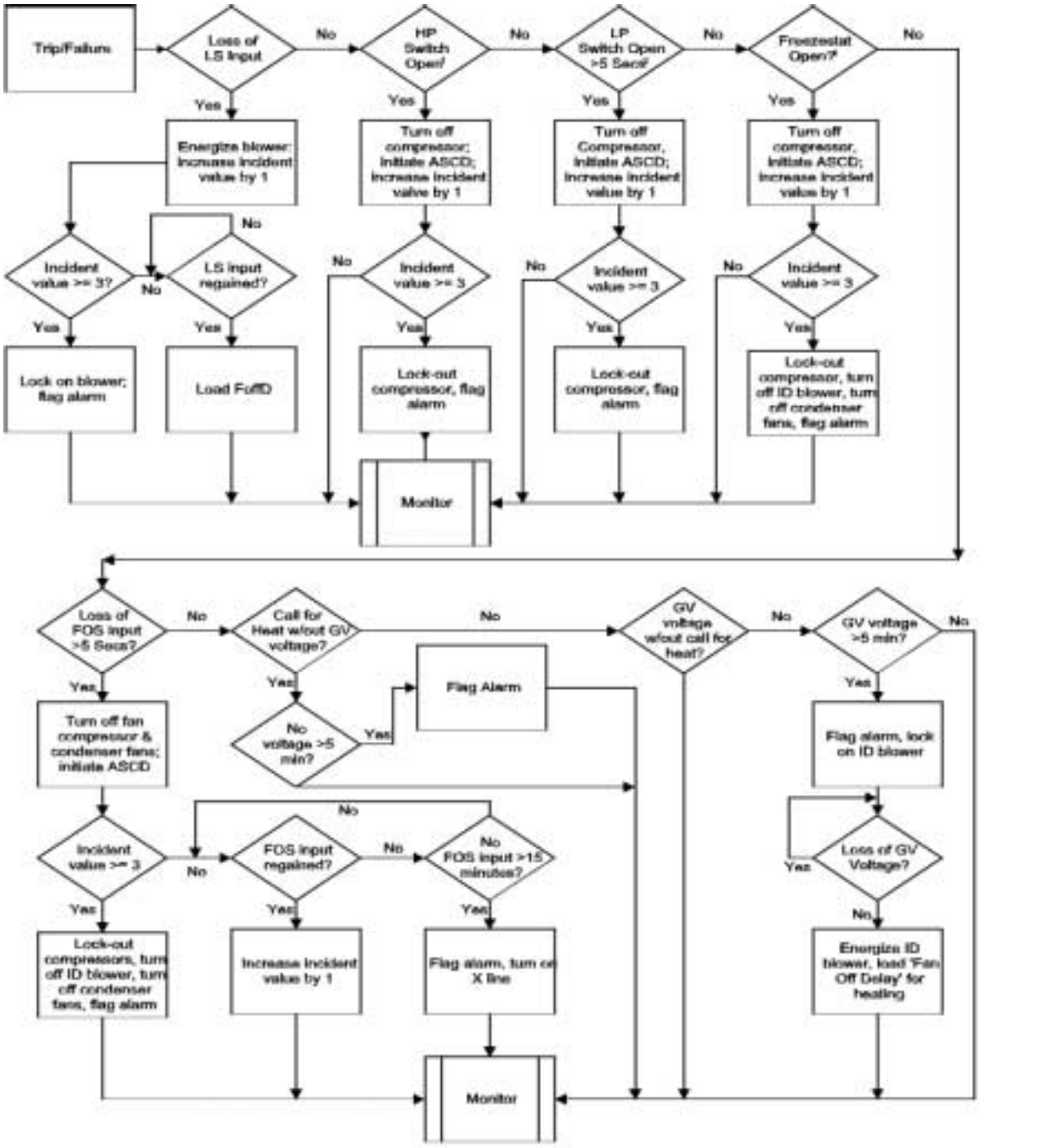



**FIGURE 21 : BASIC TROUBLESHOOTING FLOWCHART**




1 The control board only monitors the input when the compressor really is energized.
2 The low-pressure switch is not monitored for the first 30 seconds of compressor activity. The control board then monitors the switch to ensure it closes. If the switch remains open and additional 30 seconds, the control board turns off the associated compressor and initiates the ASCD. Once it has closed during the start up period, the control board no longer handles the low-pressure switch differently than other inputs.

**FIGURE 22 : TRIP FAILURE FLOW CHART**

## COOLING TROUBLE SHOOTING

On calls for cooling, the compressor(s) is/are operating but the supply air blower motor does not energize after a short delay (the room thermostat fan switch is in the “AUTO” position).

1. Turn the thermostat fan switch to the ON position. If the supply air blower motor does not energize, go to Step 3.
2. If the blower motor runs with the fan switch in the ON position but will not run after the first compressor has energized when the fan switch is in the AUTO position, check the room thermostat for contact between R and G in the AUTO position during calls for cooling.
3. If the supply air blower motor does not energize when the fan switch is set to ON, check that line voltage is being supplied to the contacts of the M3, contactor, and that the contactor is pulled in. Check for loose wiring between the contactor and the supply air blower motor.
4. If M3 is pulled in and voltage is supplied to M3, lightly touch the supply air blower motor housing. If it is hot, the motor may be off on inherent protection. Cancel any thermostat calls and set the fan switch to AUTO. Wait for the internal overload to reset. Test again when cool.
5. If M3 is not pulled in, check for 24 volts at the M3 coil. If 24 volts are present at M3 but M3 is not pulled in, replace the contactor.
6. Failing the above, if there is line voltage supplied at M3, M3 is pulled in, and the supply air blower motor still does not operate, replace the motor.
7. If 24 volts is not present at M3, check that 24 volts is present at the UCB supply air blower motor terminal, “FAN”. If 24 volts is present at the FAN, check for loose wiring between the UCB and M3.
8. If 24 volts is not present at the “FAN” terminal, check for 24 volts from the room thermostat. If 24 volts are not present from the room thermostat, check for the following:
   a. proper operation of the room thermostat (contact between R and G with the fan switch in the ON position and in the AUTO position during operation calls),
   b. proper wiring between the room thermostat and the UCB, and
   c. loose wiring from the room thermostat to the UCB.
9. If 24 volts is present at the room thermostat but not at the UCB, check for proper wiring between the thermostat and the UCB, i.e. that the thermostat G terminal is connected to the G terminal of the UCB, and for loose wiring.
10. If the thermostat and UCB are properly wired, replace the UCB.

On calls for cooling, the supply air blower motor is operating but compressor #1 is not (the room thermostat fan switch is in the “AUTO” position).

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling and the compressors will not immediately operate. If both stages of cooling are requested simultaneously and the economizer provides free cooling, following a short delay compressor #1 will be energized unless it is locked out. If compressor #1 is locked out, compressor #2 is energized. Compressor #2 is always energized in place of compressor #1 when compressor #1 is requested but locked out.
2. If no economizer is installed or the economizer is not opening to provide free cooling and compressor #1 does not energize on a call for cooling, check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts are present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts is not present from the room thermostat, check for the following: a) 24 volts at the thermostat Y1 terminal, b) proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2, and c) loose wiring from the room thermostat to the UCB.
8. If 24 volts is present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.
9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have

locked out the compressor for repeat trips. The UCB should be flashing an alarm code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, cancel any call for cooling. This will reset any compressor lock outs.

**NOTE:** While the above step will reset any lockouts, compressor #1 may be held off for the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within five minutes. Press and release the TEST button to reset all ASCDs.
11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 "OUT" terminal of the UCB. If 24 volts is present, trace the wiring from Y1 "OUT" for incorrect wiring. If 24 volts is not present at the Y1 "OUT" terminal, the UCB must be replaced.
12. *For units without economizers*: If 24 volts is present at the Y1 OUT terminal, check for 24 volts at the Y1 "ECON" terminal. If 24 volts is not present, check for loose wiring from the Y1 "OUT" terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 "ECON" terminal.
13. *For units with economizers*: If 24 volts is present at the Y1 "OUT" terminal, check for 24 volts at the Y1 "ECON" terminal. If 24 volts is not present, check for loose wiring from the Y1 "OUT" terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 "ECON" terminal. If nothing is found, the economizer DME may have faulted and is failing to return the 24-volt "call" to the Y1 "ECON" terminal even though the economizer is not providing free cooling. To test, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB's Mate-N-Lock plug. If compressor #1 energizes, there is a fault in the economizer wiring or DME.
14. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local York distributors can test the UCB for this programming.
15. If none of the above corrected the error, test the integrity of the UGB. Disconnect the C1 terminal wire and jumper it to the Y1 terminal. DO NOT jump the Y1 to C1 terminals. If the compressor engages, the UCB has faulted.
16. If none of the above correct the error, replace the UCB.

On calls for the second stage of cooling, the supply air blower motor and compressor #1 are operating but compressor #2 is not (the room thermostat fan switch is in the "AUTO" position).

1. If installed, check the position of the economizer blades. If the blades are open, the economizer is providing free cooling. If the second stage of cooling is requested, following a short delay, compressor #1 will be energized unless it is locked out. Typically, compressor #2 is energized only during free cooling if the call for the second stage of cooling persists for 20 minutes.
2. Compressor #2 will not energize simultaneously with compressor #1 if a call for both stages of cooling is received. The UCB delays compressor #2 by 30 seconds to prevent a power surge. If after the delay compressor #2 does not energize on a second stage call for cooling, check for line voltage at the compressor contactor, M2, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M2 is pulled in and voltage is supplied at M2, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M2 is not pulled in, check for 24 volts at the M2 coil. If 24 volts is present and M2 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M2, M2 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M2, check for 24 volts at the UCB terminal, C2. If 24 volts are present, check for loose wiring between C2 and the compressor contactor.
7. If 24 volts is not present at the C2 terminal, check for 24 volts from the room thermostat at the UCB Y2 terminal. If 24 volts is not present from the room thermostat, check for the following: a) 24 volts at the thermostat Y2 terminal, b) proper wiring between the room thermostat and the UCB, i.e. Y1 to Y1, Y2 to Y2, and c) loose wiring from the room thermostat to the UCB.
8. If 24 volts is present at the UCB Y2 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS2, LPS2, and FS2 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS2 has opened, there will be 24 volts of potential between the LPS2 terminals.
9. If 24 volts is present at the UCB Y2 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing a code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last

five alarms on the LED. If the compressor is locked out, remove any call for cooling at the thermostat or by disconnecting the thermostat wiring at the Y2 UCB terminal. This will reset any compressor lock outs.

**NOTE:** While the above step will reset any lock outs, compressor #1 will be held off for the ASCD, and compressor #2 may be held off for a portion of the ASCD. See the next step.

10. If 24 volts is present at the UCB Y2 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within five minutes. Press and release the TEST button to reset all ASCDs.
11. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. Local York distributors can test the UCB for this programming.
12. If none of the above corrected the error, test the integrity of the UGB. Disconnect the C2 terminal wire and jumper it to the Y2 terminal. DO NOT jump the Y2 to C2 terminals. If the compressor engages, the UCB has faulted.
13. If none of the above correct the error, replace the UCB.

On a call for cooling, the supply air blower motor and compressor #2 are operating but compressor #1 is not (the room thermostat fan switch is in the “AUTO” position).

1. Compressor #2 is energized in place of compressor #1 when compressor #1 is unavailable for cooling calls. Check the UCB for alarms indicating that compressor #1 is locked out. Press and release the ALARMS button if the LED is not flashing an alarm.
2. Check for line voltage at the compressor contactor, M1, and that the contactor is pulled in. Check for loose wiring between the contactor and the compressor.
3. If M1 is pulled in and voltage is supplied at M1, lightly touch the compressor housing. If it is hot, the compressor may be off on inherent protection. Cancel any calls for cooling and wait for the internal overload to reset. Test again when cool.
4. If M1 is not pulled in, check for 24 volts at the M1 coil. If 24 volts is present and M1 is not pulled in, replace the contactor.
5. Failing the above, if voltage is supplied at M1, M1 is pulled in, and the compressor still does not operate, replace the compressor.
6. If 24 volts is not present at M1, check for 24 volts at the UCB terminal, C1. If 24 volts is present, check for loose wiring between C1 and the compressor contactor.
7. If 24 volts is not present at the C1 terminal, check for 24 volts from the room thermostat at the UCB Y1 terminal. If 24 volts are not present at the UCB Y1 terminal, the UCB may have faulted. Check for 24 volts at the Y1 ECON terminal. If 24 volts is not present at Y1 “ECON”, the UCB has faulted. The UCB should de-energize all compressors on a loss of call for the first stage of cooling, i.e. a loss if 24 volts at the Y1 terminal.
8. If 24 volts are present at the UCB Y1 terminal, the compressor may be out due to an open high-pressure switch, low-pressure switch, or freezestat. Check for 24 volts at the HPS1, LPS1, and FS1 terminals of the UCB. If a switch has opened, there should be a voltage potential between the UCB terminals, e.g. if LPS1 has opened, there will be a 24-volt potential between the LPS1 terminals.
9. If 24 volts is present at the UCB Y1 terminal and none of the protection switches have opened, the UCB may have locked out the compressor for repeat trips. The UCB should be flashing a code. If not, press and release the ALARMS button on the UCB. The UCB will flash the last five alarms on the LED. If the compressor is locked out, remove any call for cooling. This will reset any compressor lock outs.

**NOTE:** While the above step will reset any lock outs, compressor #2 will be held off for the ASCD, and compressor #1 may be held off for a portion of the ASCD. See the next step.

10. If 24 volts is present at the UCB Y1 terminal and none of the switches are open and the compressor is not locked out, the UCB may have the compressor in an ASCD. Check the LED for an indication of an ASCD cycle. The ASCD should time out within five minutes. Press and release the TEST button to reset all ASCDs.
11. If 24 volts is present at the UCB Y1 terminal and the compressor is not out due to a protective switch trip, repeat trip lock out, or ASCD, the economizer terminals of the UCB may be improperly wired. Check for 24 volts at the Y1 “OUT” terminal of the UCB. If 24 volts is present, trace the wiring from Y1 “OUT” for incorrect wiring. If 24 volts is not present at the Y1 “OUT” terminal, the UCB must be replaced.
12. *For units without economizers*: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, the jumper in the Mate-N-Lock plug, and in the wiring from the Mate-N-Lock plug to the Y1 “ECON” terminal.

    *For units with economizers*: If 24 volts is present at the Y1 “OUT” terminal, check for 24 volts at the Y1 “ECON” terminal. If 24 volts is not present, check for loose wiring from the Y1 “OUT” terminal to the Mate-N-Lock plug, a poor connection between the UCB and economizer Mate-N-Lock plugs, loose wiring from the Mate-N-Lock plug to the economizer, back to the Mate-N-Lock plug, and from the Mate-N-Lock plug to the Y1 “ECON” terminal. The economizer board may have faulted and is not

returning the 24 volts to the Y1 "ECON" terminal even though the economizer is not providing free cooling. To test the economizer board, disconnect the Mate-N-Locks and jumper between the WHITE and YELLOW wires of the UCB's Mate-N-Lock plug.

13. The UCB can be programmed to lock out compressor operation during free cooling and in low ambient conditions. These options are not enabled by default. They can be checked by local York distributors.
14. If none of the above corrected the error, test the integrity of the UGB. Disconnect the C1 terminal wire and jumper it to the Y1 terminal. DO NOT jump the Y1 to C1 terminals. If the compressor engages, the UCB has faulted.
15. If none of the above correct the error, replace the UCB.

## HEATING OPERATION

A demand for first stage heat from the thermostat completes the circuit between R and W1. This 24vac signal is passed through the UCB to the RY1 Relay. Contacts RY1-1 open, assuring the reversing valve cannot be energized, except during defrost. Contacts RY1-2 close, completing the circuit to Y on the defrost control (DC). After its five minute ASCD timer is satisfied, the DC closes it's internal compressor relay contacts, sending a 24vac signal to the MV terminal on the UCB. If its ASCD timer is satisfied the UCB will energize compressor 1 relay. After a two second delay, it then energizes compressor #2 relay (if applicable). Therefore, on a call for heat from W1, both compressors are always energized, unless one or the other is locked out by the UCB. Also on the call for heat, the DC energizes the M4 contactor which brings on both condenser fans.

***NOTE***: the 6-1/2 ton unit has only one compressor.

A second stage call from the thermostat completes the circuit between R and W2. This 24vac signal is passed through the UCB to the defrost control board. If the unit is equipped with an optional electric heater it would be energized through a set of normally closed contacts on the defrost board. Take note that the MV terminal on the UCB is constantly monitored while there is a demand for heat. If the UCB does not see 24vac at terminal MV after six minutes, it initiates a fault code 9, indicating a heating problem.

As mentioned earlier, the defrost control (DC) utilizes a time/temperature defrost scheme. The following two conditions must be met before the DC will enter a defrost mode:

1. The DC must first satisfy its accumulated minimum run time. This is factory set at 60 minutes, but is field adjustable to 30, 60 or 90 minutes.
2. Either of the two defrost thermostats (DF1 or DF2) must be closed. These normally open thermostats are mounted on the respective liquid lines and are set to close at 31 degrees (+/-3).

If neither defrost thermostat is closed at the completion of it's minimum accumulated run time cycle, the DC initiates another run time cycle, which it must complete before it looks at the position of the defrost thermostats. This action is repeated until, at the completion of a run time cycle, one of the defrost thermostats is found to be closed and the DC enters defrost mode.

When the DC enters the defrost mode, it's on-board defrost relay is powered. This energizes both reversing valves, de-energizes both condenser fan motors and energizes the unit's optional electric heater. The DC remains in defrost mode until either of the following two conditions is met:

1. Both of the liquid line thermostats are open. Each is set to open at 55 degrees (+/- 3).
2. The maximum defrost run time of 10 minutes is met.

The DC also contains a set of test pins. Placing a jumper across these pins will result in the following actions:

- If the ASCD timer is active, it is now by-passed, allowing the compressor to run.
- If the DC is in a lockout condition, the lockout is reset.
- If the compressor is running, the DC is forced into defrost mode. The control will remain in defrost mode for as long as the jumper is in place. When the jumper is removed, the control will terminate the defrost mode in the normal manor as described above.

**NOTE:** The DC has two flashing codes which are only initiated if the two pressure switch terminals are open. As used in the Predator, there is a jumper across the pressure switch terminals. Therefore the field should never experience a DC lockout mode unless that jumper is removed or broken.

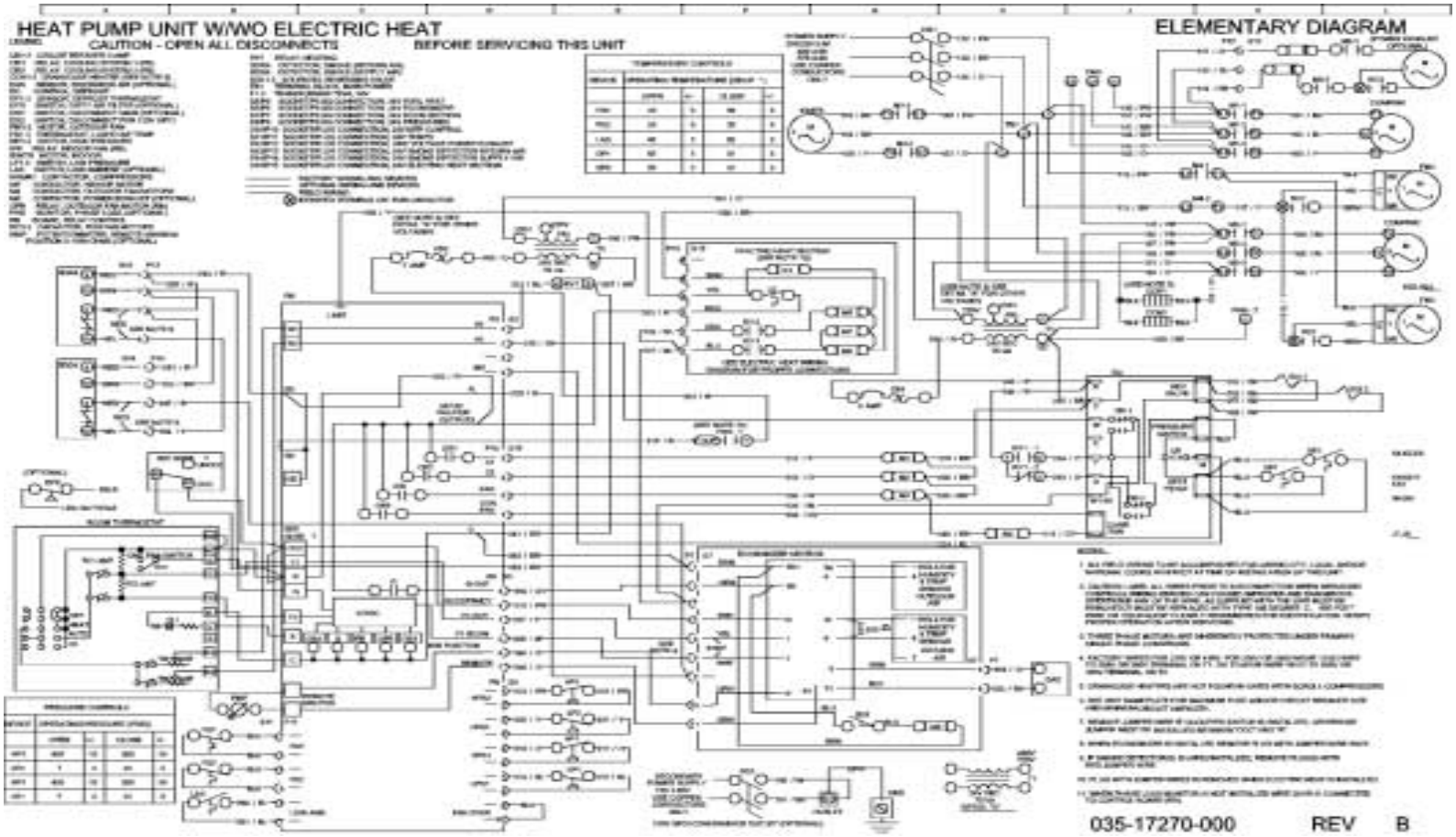

HEAT PUMP UNIT W/WO ELECTRIC HEAT
CAUTION - OPEN ALL DISCONNECTS BEFORE SERVICING THIS UNIT
ELEMENTARY DIAGRAM
035-17270-000 REV B

**FIGURE 1 : HEAT PUMP UNIT WITH OR WITHOUT ELECTRIC HEAT**

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035-17275-000 REV B (0201)
Supersedes: 035-17275-000 REV A (800)

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